

Journal of the Royal Society of Arts

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FEBRUARY 1959

VOL. CVII

FORTHCOMING MEETINGS

TUESDAY, 27TH JANUARY, at 5.15 p.m. COMMONWEALTH SECTION. THOMAS HOLLAND MEMORIAL LECTURE. '*The Commonwealth Transantarctic Expedition*', by Sir Vivian Fuchs, M.A., Ph.D. The Right Honble. Lord Cohen of Birkenhead, M.D., F.R.C.P., in the Chair. (The Lecture will be illustrated by lantern slides. Tea will be served in the Library from 4.30 p.m.) *No more tickets are available for this meeting.*

WEDNESDAY, 28TH JANUARY, at 2.30 p.m. FRED COOK MEMORIAL LECTURE. '*Illusionist Decoration of the Italian Renaissance*', by Sir Anthony Blunt, K.C.V.O., Professor of History of Art, University of London, and Director, Courtauld Institute of Art. Ellis K. Waterhouse, C.B.E., M.A., Barber Professor of Fine Arts, and Director of the Barber Institute, University of Birmingham, in the Chair. (The Lecture will be illustrated by lantern slides.)

WEDNESDAY, 4TH FEBRUARY, at 2.30 p.m. ALFRED BOSSOM LECTURE. '*The Mechanization of Building Constructional Processes*', by D. G. R. Bonnell, Ph.D., Deputy Chief Scientific Officer, Building Research Station, D.S.I.R. Sir Alfred Bossom, Bt., LL.D., F.R.I.B.A., J.P., M.P., Chairman of Council of the Society, in the Chair. (The paper will be illustrated by lantern slides.)

TUESDAY, 10TH FEBRUARY, at 5.15 p.m. COMMONWEALTH SECTION. '*The History of the African Pyrethrum Industry*', by T. F. West, D.Sc., Ph.D., F.R.I.C., A.M.I.Chem.E., European Operations Executive, African Pyrethrum Technical Information Centre Ltd. Sir Ian Heilbron, D.S.O., F.R.S., Professor Emeritus of Organic Chemistry, University of London, in the Chair. (The Paper will be illustrated by lantern slides. Tea will be served in the Library from 4.30 p.m.)

WEDNESDAY, 11TH FEBRUARY, at 2.30 p.m. PETER LE NEVE FOSTER LECTURE. '*Women as Writers*', by Miss Sylvia Townsend Warner. Leonard Woolf in the Chair.

FRIDAY, 13TH FEBRUARY, at 7.30 p.m. FILM EVENING. (See programme on p. 158.)

WEDNESDAY, 18TH FEBRUARY, at 2.30 p.m. '*Rheology: the Science of Plastic Flow*', by E. G. Richardson, D.Sc., Professor of Acoustics, University of Durham.

G. W. Scott-Blair, M.A., D.Sc., Ph.D., Head of Physics Department, National Institute for Research in Dairying, University of Reading, will preside.

WEDNESDAY, 25TH FEBRUARY, at 2.30 p.m. '*Designing, Building and Sailing Yachts and Boats*', by Uffa Fox, C.B.E., R.D.I. Sir Alfred Bossom, Bt., LL.D., F.R.I.B.A., J.P., M.P., Chairman of Council of the Society, in the Chair. (*Fellows who wish to be sure of seats are advised to apply for tickets, and in doing so to state whether they will be accompanied by one or two guests.*)

MONDAY, 2ND MARCH, at 6 p.m. The first of three CANTOR LECTURES on '*Some of England's Country Houses*', by Sir John Summerson, C.B.E., A.R.I.B.A., F.B.A., F.S.A., Curator, Sir John Soane's Museum.

WEDNESDAY, 4TH MARCH, at 2.30 p.m. '*The Future of the Nash Terraces*', by Richard H. Davies, A.A.Dip., F.R.I.B.A. Sir Thomas Bennett, K.B.E., F.R.I.B.A., will preside.

THURSDAY, 5TH MARCH, at 5.15 p.m. COMMONWEALTH SECTION. '*The Art of the Australian Aborigines and its Place in their Lives*', by Charles Mountford, F.R.A.I. Sir Hugh Casson, R.D.I., M.A., F.R.I.B.A., in the Chair. (The Paper will be illustrated by lantern slides and a film. Tea will be served in the Library from 4.30 p.m.)

MONDAY, 9TH MARCH, at 6 p.m. The second of three CANTOR LECTURES on '*Some of England's Country Houses*', by Sir John Summerson.

WEDNESDAY, 11TH MARCH, at 2.30 p.m. '*Some Achievements of the International Geophysical Year*', by D. C. Martin, B.Sc., Ph.D., F.R.I.C., F.R.S.E., Assistant Secretary, the Royal Society.

FRIDAY, 13TH MARCH, at 7.30 p.m. FILM EVENING.

Fellows are entitled to attend any of the Society's meetings without tickets (except where otherwise stated), and may also bring two guests. When they cannot accompany their guests, Fellows may give them special passes, books of which can be obtained on application to the Secretary.

FILM EVENING

The third Film Evening of the Session will be held at the Society's House on Friday, 13th February, at 7.30 p.m. The programme to be screened is as follows:

City of Gold
England of Elizabeth
Forming of Metals
Paintings Need Care

City of Gold (20 minutes) is a moving evocation of the Canadian Gold Rush, based on recent shots of Dawson City skilfully merged with pictorial records

composed at the time of the Gold Rush itself. The film was made by the Canadian National Film Board and is being screened by special permission of Scottish Television Ltd.

England of Elizabeth (27 minutes), made in colour by British Transport Films, was released in time to mark the quatercentenary of the accession of Queen Elizabeth I. Some of the visible traces, as well as something of the spirit, of the England of Elizabeth, Drake, Raleigh and Shakespeare are recorded in the film, for which Dr. Ralph Vaughan Williams wrote the music.

Forming of Metals (28 minutes), produced by the Shell Film Unit, is also in colour. It is concerned with the various processes by which metals are 'formed', that is, squeezing, pressing and rolling, as opposed to machining.

Paintings Need Care (10 minutes), a Polish film, shows how old paintings can be transferred from a damaged or rotted canvas to an entirely new one.

Tickets of admission are not required for this occasion, and Fellows are entitled to introduce two guests. Light refreshments will be served in the Library after the performance.

AWARD OF THE BENJAMIN FRANKLIN MEDAL FOR 1958

With the approval of H.R.H. the President, the Benjamin Franklin Medal for 1959 has been awarded to Mr. H. G. Nelson, M.A., M.I.C.E., M.I.Mech.E., M.I.E.E., Managing Director of The English Electric Company Ltd. since 1956, 'for his work in scientific industrial development'.

It will be remembered that this award (instituted in 1956 to commemorate the 250th anniversary of Benjamin Franklin's birth and the bicentenary of his election to membership of the Society) is made annually to 'individuals who have attained early distinction, with promise of further achievement, in the promotion of arts, manufactures and commerce'. The first recipient of the award was Professor F. C. Williams of Manchester University, 'for his contributions to electrical engineering'. Last year the medal was awarded to Mr. Peter Ustinov 'for his work in the field of drama'.

The son of Sir George Nelson Bt., Mr. Nelson was born in 1917 and educated at Oundle and King's College, Cambridge. He joined English Electric in 1939, at a time when this organization was comparatively small in terms of turn-over and personnel. In almost the whole of the subsequent expansion he has played a decisive part. In particular, he effected the successful assimilation by English Electric of two major subsidiary companies, namely D. Napier & Son Ltd., in 1942, and the Marconi Wireless Telegraph Company Ltd., three years later. An able engineer himself, he has not only made it his duty to master every phase of the English Electric Company's operations, but has successfully co-ordinated the structure of this great industrial enterprise (which now employs 70,000

people), while extending its range both in products and geographical scope. As managing director he is generally responsible for all the group's electrical, steam turbine, and diesel engineering, for its guided missiles, aircraft, computers and locomotives. He is also one of the three executive directors of a consortium in charge of a contract to build the world's largest Atomic Power Station at Hinkley Point, Somerset.

AWARD OF THE SWINEY PRIZE FOR 1959

On the recommendation of a joint Committee of the Royal Society of Arts and the Royal College of Physicians, the Swiney Prize for 1959 has been awarded to Dr. Keith Simpson, Reader in Forensic Medicine to the University of London at Guy's Hospital Medical School, for his work *Forensic Medicine* (third edition).

The prize, which is offered for the best published work alternately on medical and general jurisprudence, consists of £100 in cash and a silver cup of like value, and is awarded on every fifth anniversary of the death of the testator, Dr. George Swiney (*ob.* 21st January, 1844). There were fourteen entries for the present award, of which full details appeared in the *Journal* for March, 1958.

FUTURE DEVELOPMENT OF THE SOCIETY

In November, 1958, the Council appointed a Committee 'to review the present activities of the Society with the object of ensuring that its aims are being pursued in the most suitable and rewarding manner, and to make such recommendations as may seem appropriate for the future' (see *Journal* for December, 1958, page 10). The Committee has already received a number of proposals bearing upon different aspects of the Society's work, and it would welcome further suggestions from Fellows who wish to take this opportunity of putting forward their own ideas for future development. It would be helpful if communications of this kind from Fellows resident in the United Kingdom were to reach the Secretary by the end of February; and if those from Fellows living overseas were to be sent (by the quickest route) before the end of April.

MEETING OF COUNCIL

A meeting of Council was held on Monday, 12th January. Present: Sir Alfred Bosson (in the Chair); Mrs. Mary Adams; Sir Hilary Blood; the Honble. G. C. H. Chubb; Sir Edward Crowe; Mr. R. E. Dangerfield; Sir George Edwards; Mr. John Gloag; Sir Ernest Goodale; Mr. A. C. Hartley; Dr. R. W. Holland; Mr. William Johnstone; Lord Latham; Mr. Edgar E. Lawley; Sir Harry Lindsay; Mr. F. A. Mercer; Mr. Oswald P. Milne; Lord Nathan; the Earl of Radnor; Sir Gilbert Rennie; Mr. A. R. N. Roberts; Professor R. D. Russell; Sir Philip Southwell; Professor S. Tolansky; Mr. G. E. Tonge; Mr.

H. A. Warren; Sir Griffith Williams and Miss Anna Zinkeisen; with Mr. G. E. Mercer (Deputy Secretary) and Mr. J. S. Skidmore (Assistant Secretary).

ELECTIONS

The following candidates were duly elected Fellows of the Society:

Ballin, Harold Hans, Ph.D., B.Sc., London.
Body, William Trevor, B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.E.E., Horsham, Sussex.
Boot, Christopher, B.Sc., A.I.Struct.E., London.
Broad, Sidney Thomas, M.A., Welwyn Garden City, Herts.
Burton, Percy Basil Harmsworth, B.A., London.
Chaudhri, Mohamed Rafique, M.B., B.S., Nairobi, Kenya, East Africa.
Finch, Morris William, A.R.C.A., Blackpool, Lancs.
Garside, David, B.Sc., A.C.G.I., D.I.C., A.M.I.C.E., Kuala Lumpur, Malaya.
Gerhard, Derek James, Ph.D., Henley-on-Thames, Oxon.
Giddings, William Frank, B.Sc.(Eng.), A.C.G.I., D.I.C., M.I.E.E., London.
Gilchrist, William Spence, M.A., Bromley, Kent.
Gunn, Donald Alastair, London.
Hall, Harry Gilbert, F.I.M., Walsall, Staffs.
Harker, Richard Allen, B.A., A.M.I.Mech.E., Croydon.
Herbert, Robert David, Jun., Nashville, Tennessee, U.S.A.
Kent, Wilfred Robin Leigh, B.A., A.M.I.Mech.E., A.M.I.E.E., Sunningdale, Berks.
Langford, Edward John, M.A., London.
McNeil, Hector, B.E., M.I.E.E., M.I.Mech.E., London.
Miranda, Raymond, Bahrain, Persian Gulf.
Patron, Clément Paul, Beau Bassin, Mauritius.
Pennell, Ronald, Sutton Coldfield, Warwicks.
Riley, Arthur Newham, Derby.
Short, The Reverend Graham, B.A., London.
Sutcliffe, Vernon, Weston-super-Mare, Somerset.
Tauté, Matthys, M.C., A.R.I.B.A., London.
Thornhill, Gordon Owen, Foston, Derbyshire.
Tuckwell, Frank Ian, Sutton Coldfield, Warwicks.
Widdicombe, Eric John, Harrow, Middx.
Woodhouse, Francis Edward, F.R.C.O., F.T.C.L., London.

VACANCY ON COUNCIL

Mr. William Johnstone was appointed to fill the vacancy on the Council caused by the death of Sir William Halcrow.

BENJAMIN FRANKLIN MEDAL FOR 1959

The Benjamin Franklin Medal for 1959 was awarded to Mr. G. H. Nelson (see separate Notice on page 159).

SWINEY PRIZE FOR 1959

It was reported that the Swiney Prize for 1959 had been awarded to Dr. Keith Simpson (see separate Notice on page 160).

CITY AND GUILDS OF LONDON INSTITUTE

An invitation to the Society to become an Honorary Member of the City and Guilds of London Institute was accepted, and it was agreed that, in addition to the Chairman of Council, the Chairman of the Examinations Committee (Dr. R. W. Holland) should *ex officio* represent the Society on the Council of the Institute.

OTHER BUSINESS

A quantity of financial and other business was transacted.

JOURNAL INDEX AND BINDING CASES

The index and title page for Volume 106 of the *Journal* are now ready, and will be sent, free of charge, to Fellows who ask for them. Orders for binding cases (with which copies of the index and title page are supplied as a matter of course) should be sent to P. G. Chapman & Co., Ltd., Kent House Lane, Beckenham, Kent, who will also undertake the work of binding for an additional charge.

THE CONSULTING ENGINEER AND HIS CONTRIBUTION TO THE NATIONAL ECONOMY

A paper by

JULIAN S. TRITTON, M.I.C.E., M.I.Mech.E., M.Cons.E.,

*President, International Federation of Consulting
Engineers, read to the Society on Wednesday,
3rd December, 1958, with J. K. Vaughan-
Morgan, M.P., Minister of State, Board of Trade,
in the Chair*

THE CHAIRMAN: Mr. J. S. Tritton is a consultant in a very famous firm of consulting engineers, Messrs. Rendel, Palmer and Tritton. A former Chairman of the Association of Consulting Engineers, he is now the President of the International Federation of Engineers, and I am particularly glad to say that he is also a member of the Advisory Council on Overseas Construction of which I, in my capacity of Minister of State for the Board of Trade, am the Chairman. I well know the value of his advice to that Council, which surveys the many problems that beset consulting engineers and the constructional industry in their endeavours to promote indirect and direct British exports overseas. I was reminded to-day that the total value of work for which British consulting engineers were responsible in 1957 was the enormous figure of £550 million. I am sure we shall listen with great interest to what Mr. Tritton has to say this afternoon.

The following paper, which was illustrated by lantern slides, was then read:

THE PAPER

The forthcoming negotiations for the European Free Trade Area, and this country's expansion during the last few years in its export trade, have drawn attention to the importance of the consulting engineer and particularly to the value of his work overseas.

It may surprise those present to-day to learn that the value of major overseas engineering works for which members of the Association of Consulting Engineers were responsible last year, was no less than £550 million. The projects are spread around the world from Vancouver to New Zealand, from Labrador to the Cape. Assuming that there is about the same volume of consulting work for clients in the United Kingdom, this would mean that the total value of actual works in hand may well exceed £1,000 million.

In addition, the current annual report of the Association of Consulting Engineers shows that the estimated value of overseas projects on which members have been instructed to carry out investigations and reports is over £400 million. So it is fair to say that the 500 or so members of the Association are making an important contribution to the national economy both at home and overseas.

Before expatiating on this subject, however, I feel there may be many here who are not familiar with the functions and duties of the consulting engineer. Everyone knows what a doctor, a lawyer or an architect does, because most people at some time or other have had occasion personally to use their professional services. But comparatively few people know what a consulting engineer does, or realize how much they owe him for their safety and comfort when they use the bridges, harbours, railways, power and water supplies and other amenities which are the result of his skill in, to quote our Civil Engineers' Charter, 'directing the great sources of power in nature for the use and convenience of man'.

One reason why the consulting engineer is not better known is that there are so few of them. There are only some 500 members of the Association—all 'Chartered Engineers'—that is, all are members of one or more of the three parent Institutions, 'Civils', 'Mechanicals' and 'Electricals', whose combined membership exceeds 80,000. So less than one per cent are consulting engineers.

Code of Practice

Another reason is that, like lawyers, doctors and other professional bodies, they are not allowed to advertise.

When the Association of Consulting Engineers was founded in 1913, its by-laws, rules and code of practice embodied and amplified the provisions of the parent Institution's by-laws, so as to cover members practising in all fields of consulting work. The list of members shows that there are twenty-two branches of engineering in which members practise, and many of these are sub-divided into specialist headings.

The Consulting Engineer

A consulting engineer is defined as a person possessing the necessary qualifications to practise in one or more of the various branches of engineering, who devotes himself to advising the public on engineering matters, or to designing and supervising the construction of engineering works. What distinguishes him from other engineers who may be capable of carrying out these duties is that he must be in a position to give 'independent' advice, that is to say that he has no commercial or manufacturing interests such as would tend to influence the exercise of his independent professional judgement in the matters upon which he advises.

The Clients

The consulting engineer draws his clients from an almost unlimited field—ministries, Government departments at home and overseas, county councils, provincial and local administrations as well as those firms in industry and commerce which spend vast sums on new factories, docks, power stations and other capital projects.

Some administrations may take the attitude—'We employ a fully qualified chief engineer; why should we pay outside consultants to do his work?' The answer depends on the policy of the administration. If the work is outside the

normal loading of the chief engineer's staff, the board will decide whether to take on extra staff to cope with the temporary overload, or to call in a consulting engineer, who is experienced in that particular class of work and who has technical engineering staff available.

There is no challenge to the chief engineer's authority when a consultant is called in, since he remains in control throughout. Experience shows that he is often glad of an 'independent opinion' to support his recommendations to his board.

Let us consider this question from the point of view of a potential client, one of the 'unconverted' who 'have no use for consulting engineers'!

We will assume that an overseas administration has decided that a bridge is required to carry city traffic across a river, and its chief engineer has been instructed to obtain tenders for this work. If, as sometimes happens, he is not familiar with the rôle of the consulting engineer, his first idea is to look through the pages of a technical journal, where he will find the very compelling advertisements of firms of international repute which build bridges. He then probably writes to two or three of them and asks them to send in their proposed designs and estimates.

The contracting firms are, of course, only too pleased to oblige and the news soon gets around the contracting circles that there is a big job in the offing. The chief engineer is then beset on all sides by the agents for the various bridge builders, until at the end of a few weeks he has on his desk some half dozen preliminary designs and estimates for the new bridge. The designs are all different and the estimates vary by two or three hundred per cent.

Let us think for a moment of what has been involved in this process. Each of the firms which are putting forward their tenders has spent considerable time and money in sending out its engineers to the site, in making inquiries into site conditions, taking soundings, borings, etc., and then getting out a design which the engineers think is the most suitable for the job. To get out such a proposal may cost each firm some thousands of pounds, but only one of them, the successful tenderer, will see his money back on this preliminary expenditure. Such a course must, therefore, involve a wasteful expenditure of energy.

The chief engineer then has the difficult task of comparing offers which are seldom on a strictly comparable basis. The widely differing features have to be evaluated and it is always possible that none of the designs embodies all the requirements. He then realizes that his selection, made with the best will in the world, is open to challenge by interested and disappointed parties and that he would be in a much stronger position if his recommendation were supported by an *independent* professional opinion. Expenditure of public funds is a grave responsibility and, be it whispered, even Finance Committees have been known to quail before the threat of 'a question in the House' on the awarding of a contract. So at this stage, the board too would feel happier if, in applying for Government sanction for funds, it can say the plan has been 'examined and approved by an independent consulting engineer'.

In what follows I hope to show how time and effort, which mean money, can

be saved in such cases by calling in a consulting engineer to advise on the project from the start. His first task will be to ascertain the client's exact requirements. He will then interpret these in his designs, specifications and conditions of contract, so that tenderers know just what is required and what risks have to be covered. Tenders are then on a fair and comparable basis and the client is thus assured of the best value for his money.

Whom to Call In

The selection of a suitable consulting engineer is not a difficult matter. Most authorities know the consultants they are accustomed to work with on different classes of work and call them in as required. Where a client does not know whom to go to, he has only to ask the Secretary of the Association of Consulting Engineers and the Chairman will put forward two or three names for the client to select from. Nomination by the Chairman in this way ensures not only that the engineers or firms named are experienced in the particular class of work, but also that they have the capacity available at the time.

Procedure

The correct procedure is then for the client to approach one of the recommended consultants for a preliminary discussion and quotation. The question of fees will arise, and as a general guide to the cost of employing a consulting engineer, the Association has laid down a scale of fees which will be quoted by any of its members when he is asked to do so. It should be noted that the rules of the Association provide for variation from the normal scale, both above and below it, to allow higher fees to be charged for difficult and special classes of work, while lower fees may be quoted where these are justified for repetitive or other work where the amount of designing is small relative to the total cost of the work.

A word of warning here may not be out of place to prospective clients who do not appreciate that consulting engineers *may not answer advertisements for professional services*, or 'knowingly compete' with one another in the matter of fees.

Some authorities have a rule that 'all engineering contracts over a certain value must go to public tender'. This rule, however, cannot be taken to apply to consulting services, because there can be no specification for them which would put offers on a comparable basis. Indeed, it was decided not long ago in an American court that the practice of calling for public tenders for consulting engineers' services was illegal.

When the terms are agreed the consulting engineer 'accepts the reference', and is given a 'letter of appointment' or 'signs an agreement'. In this country we have a nice distinction in terms which is sometimes lost sight of. A client signs an 'agreement' with his consulting engineer, but a 'contract' with his contractors.

Competition

Although members of the Association do not knowingly compete with one another, they have to meet competition from outside the Association. Such

competition comes sometimes from contracting and manufacturing firms which offer consulting and designing services as part of a package bid, or as an inducement to place orders. Occasionally the prospective purchaser is given to understand that he is getting these services 'free of charge'—but a moment's thought will show that there is no such thing as 'free engineering'.

There is also competition from consulting engineers who, for one reason or another, are not members of any professional association. Such people are not tied by any professional code of practice. They can advertise, act under the protection of a limited liability company and, without guarantee of their competence or independence, can offer services at 'cut rates'.

International Competition

In the international field there is competition between consulting engineers of different countries, particularly when they are looked on as the 'spearhead of the export drive'. In some continental countries there have sprung up in recent years national organizations which have been formed by groups of consulting engineers, usually with the backing of finance houses. These organizations are in a position, when a large engineering project is under consideration, to send selected members of the group to the site, make a survey and project report, and then offer consulting services for the scheme. In some cases these organizations may have the support of their Governments. So far, the United Kingdom has relied on the individual efforts of the leading firms of consulting engineers in such cases, but in view of the increasing international competition, it would seem opportune for some such organization to be formed in this country, and, if it can obtain Government support, such a movement would be welcomed by the Association of Consulting Engineers.

Waterloo Bridge

To illustrate the normal course of procedure, I have taken Waterloo Bridge as a typical example of a consulting engineer's work for a public body as the client.

In the year 1923 the old Waterloo Bridge, one of Rennie's masterpieces which had stood for over 100 years, gave signs of weakness due to failure of the foundations of one or two of the piers (Figure 1). The London County Council called in consulting engineers to examine the damage and assess the safety of the bridge (Figure 2).

The Project Report and Estimate

Such an important public work in the capital city of the Commonwealth called for special consideration, and the London County Council, as the controlling authority, after a long controversy, decided in 1932 to instruct their appointed consulting engineer, Sir Frederick Palmer, to make a project report and estimate, comprising a detailed study not only of the site conditions, the foundations for the piers and approaches, but also of the layout of the connections to the main thoroughfares on either side of the river. Sir Frederick was

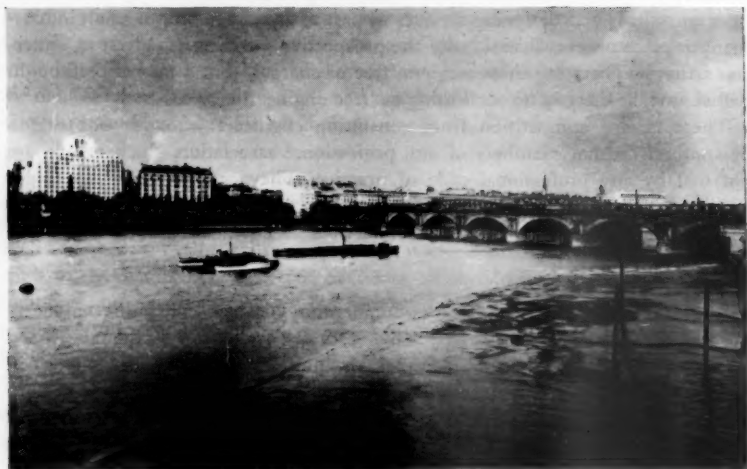


FIGURE 1. *Old Waterloo Bridge*

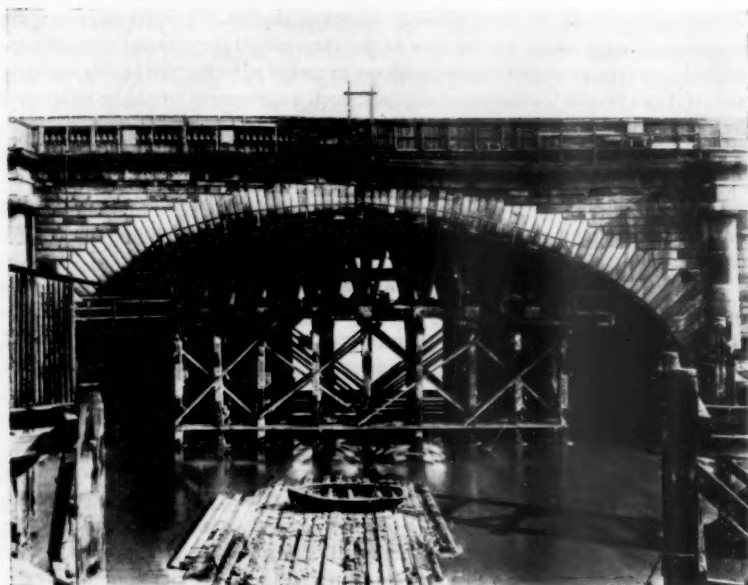


FIGURE 2. *Old Waterloo Bridge—a closer view showing the temporary shoring*

asked to submit a scheme to *recondition and widen the old bridge* to suit modern requirements. A great deal of this preliminary work had, of course, to be carried out in conjunction with the Ministry of Transport, the London County Council, the Port of London Authority, and other public bodies which had an interest in or would be affected by the proposed new works. The architectural features had also to be approved by the appointed architect, Sir Giles Scott. Tenders for the reconditioning scheme were invited in 1934, and firms tendering were also invited to submit alternative schemes.

Competitive Designs

A word here on competitive designs may help to clarify a common misunderstanding.

It has been argued that by calling for tenders on a single consulting engineer's approved design the client is deprived of the benefit of competition in design. This argument, however, is unsound, since it is usual to allow tenderers to put forward alternative designs, *providing they quote for the engineer's design*. The client has then a yardstick by which to measure the advantages or disadvantages of any alternative proposed.

The cost of these proposals for reconditioning and widening the existing structure encouraged the London County Council to consider the alternative of an entirely new bridge. Sir Frederick was then asked to submit proposals for a design which would fit in with the new buildings on the north side of the river and also meet the estimated needs of traffic for the next 100 years.

The adopted design was decided on after consideration of all the factors. It is a five-span bridge with 58 ft. carriageway and two 11 ft. footways with a 240 ft. clear span, contrasting with the 120 ft. clear span of the original bridge with its 27 ft. wide carriageway and 7 ft. footways.

The consulting engineer then proceeded to prepare the detailed plans and estimates for the new bridge for final approval of the County Council.

Design Considerations

For details of the design and construction I would refer you to the admirable paper on 'The New Waterloo Bridge' presented to the Institution of Civil Engineers by Messrs. Buckton and Cuerel in April, 1943. The following excerpts from the paper will give non-technical members some idea of the task which faced the designers in drawing up the plans.

The relation of the primary structural elements is shown diagrammatically in Figure 3 up to mid-bridge.

Considered longitudinally, the bridge is symmetrical about its centre, and each half consists of a twin two-span girder continuous over the first river pier (pier 1 or pier 4) and cantilevering shorewards from the abutments and into the centre span from the second pier. The gap in the centre span, between the cantilevers extending from the north and south, is filled by a suspended section, whilst each shore and cantilever carries a short span approach slab.

To realize the desired slimness of the construction a high percentage of

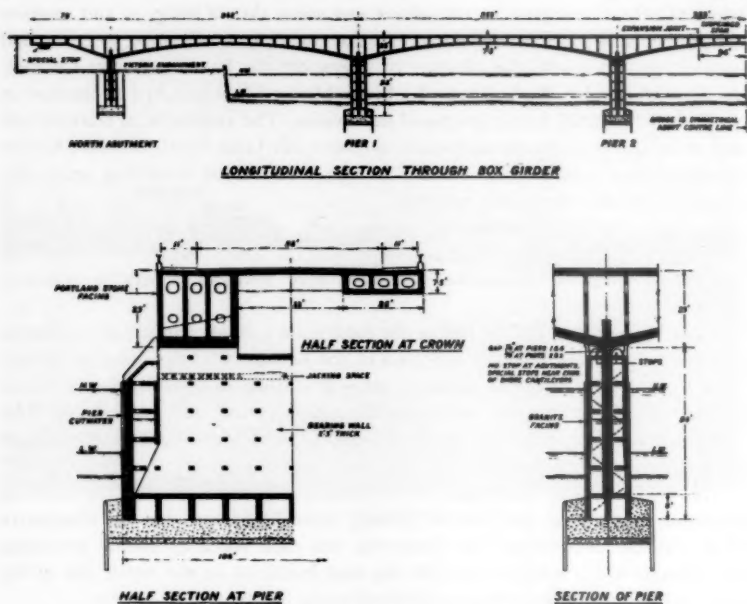


FIGURE 3. *New Waterloo Bridge*
—cross-section of the design

reinforcement was necessary, and it was evident that electric arc welding would afford many advantages.

Movements, due to jacking, deflexion, longitudinal sway, residual shrinkage, settlement of foundations, and temperature had to be anticipated. Changes in length are taken care of by the expansion joints, which also permit of angular movement in a vertical plan.

After functional and design requirements have been satisfied, a margin of latitude always remains to give play to the architect and his artistic skill. Clear, simple solutions not only provide greater beauty but are usually more efficient. This example shows the complete solution of functional requirements automatically giving a fine-looking result.

So much for the design stages, comprising the preliminary plans, approval by the client and then the tender drawings.

Conditions of Contract

We must now turn to that other essential part of the tender documents—the conditions of contract. The design drawings and specifications tell the contractor what he has to do; the conditions of contract lay down how he is to do it and how he is to be paid.

That great engineer, Sir Alexander Rendel, once said, 'It's so easy to start on half a sheet of notepaper and end in the Law Courts!' None knew better than he the value of clear-cut conditions of contract. Once they are signed they become the bible to which all parties refer throughout the work. There are two main risks to guard against; firstly, actions by the contractor to the detriment of the client—such as excessive costs or inferior work; and secondly, though not so common, unfair treatment of the contractor by the client, such as failure to pay legitimate claims, or the issuing of unwise, misleading or contradictory instructions.

It is to avoid such difficulties that there has gradually been evolved the client-consultant-contractor relationship which long experience has proved to be extremely effective. In this relationship the consultant stands between client and contractor to ensure fair treatment of both parties, as well as providing the best possible engineering advice. The conditions of contract, therefore, should set out as precisely as possible the duties and responsibilities of the three parties in relationship to one another.

Most Government departments and administrations have their Standard Conditions of Contract, and in the case of Waterloo Bridge the required modifications to the L.C.C. Standard Conditions of Contract were recommended by the consulting engineer and, after approval by the Council, embodied in the tender documents.

Call for Tenders

The tender documents, comprising the drawings for the adopted design and the conditions of contract, were then put on exhibition, and leading firms were invited by advertisement in the public Press to tender in 1937. Ten tenders were received and delivered to the L.C.C. in due course. They were subsequently examined by the consulting engineer in great detail. A report was prepared and submitted to the London County Council reviewing all the tenders submitted, and a recommendation was made for acceptance of the lowest, that of Peter Lind. The contract was accordingly placed with that firm for work on the new bridge to start in October, 1937.

Supervision

We now come to the next, and very important, stage in a consulting engineer's work, that of supervision. This stage started, in accordance with the usual practice, with the submission by the contractor to the consulting engineer of a full working scheme of his temporary works, together with the proposed method of construction and a detailed time schedule up to eventual completion. The consulting engineer examined, criticized, rejected or accepted all proposals in the schedule. Some 3,000 drawings were submitted for approval during this contract.

From the contractor's point of view the site was very cramped, but good transport facilities by road and river existed. An area on the south bank adjoining the site on the east side of the bridge was handed over for a contractor's yard and

cleared of old buildings. Canterbury Wharf on the other side of the road was used for storage and accommodated the concrete-mixing plant.

Command of the work was obtained by running a temporary gantry, about 40 ft. in width, across the river on the up-stream side of the bridge side. On the gantry were erected one fixed and six movable derrick cranes, all with a maximum out-reach of 100 ft.

The 'R.E.' and the 'Agent'

When, as in this case, construction work is subject to the supervision of the consulting engineer, he is represented on the site by his resident engineer, usually referred to as the 'R.E.', who, with his assistants, checks alignment, measurements, quantities, everything in fact that he requires to know before he can properly sign the periodical certificates on which the contractor is paid. His opposite number—the contractor's engineer-in-charge on the site—is known as the contractor's 'agent'. The problems which had to be discussed between these two engineers during the five years of the construction of Waterloo Bridge from 1937 to 1942 would fill an interesting text book!

Payment Certificates

When all is completed, the consulting engineer values the work and issues the necessary final certificate for payment to the contractor.

During such contracts there are always variations in the work to be done. On completion of the work the cost of these variations has to be checked and will form the subject of claims by the contractor. It is the duty of the consulting engineer to hear these claims and make appropriate awards where he considers they are fair and reasonable. In addition, certain claims may be put forward which are extra-contractual—i.e., outside the purview of the engineer. If agreeable to both parties, the consulting engineer will hear and report on these for consideration by the client.

Engineering Inspection

In a consulting engineer's organization, the inspecting engineer has an equally important rôle to play in contracts for the supply of plant and materials. When we read in the papers that a British firm has secured a contract for a big power station, pumping plant, ships, locomotives, pipe-line or any of the engineering products which form so important a part of our export trade, these are usually subject to inspection by an independent authority—a very necessary precaution to safeguard both client and contractor against costly errors and replacements. The inspecting engineer engaged in this service has to be just as highly skilled and experienced in his particular branch of engineering as the R.E. in his civil work.

Most contractors *welcome fair and competent inspection*. In the workshops and at site it is a safeguard to them against mistakes by their staff or their sub-contractors and it can be a great help to their supervisory staff in maintaining the quality of the work they turn out.

The ready acceptance of inspection is also good sales propaganda for the manufacturer. On the other hand, the 'awkward' firm, which has something to conceal, gets a bad name when the inspection becomes a battle of wits, amusing and enjoyable at times for the parties engaged, but profitable to neither side in the long run.

On the other hand again, all contractors rightly *resent incompetent and unfair inspection*, which can be very costly to them. The inexperienced inspector, with only text-book knowledge of his subject, is apt to insist on irrelevant details. I could quote the instance of an 'inspector' who insisted on the corners of the lightening holes in a five-ton casting being filed out to the exact radius shown on the drawing and testing them with a radius gauge! In another case, the boiler shop of a big locomotive works was held up for weeks because the inspector did not know how to run the boiler tests and refused to sign the acceptance certificate.

Relations with the Architect

In the period of post-war reconstruction in this country, architects play a leading rôle in their responsibility for the design of public buildings such as banks, hospitals and other major works.

It is sometimes not realized how great a proportion of such works involves specialized engineering knowledge. Nowadays the cost of the engineering work in a large building represents an ever-growing percentage of the total cost. Architects appreciate this and frequently advise the client to call in a consulting engineer to deal with special engineering features involved in the design. In such cases it is, of course, essential to avoid divided responsibility. This difficulty has been overcome in France, where architects and engineers work together under a protocol signed by the two professional societies. The agreement divides works into four categories, the architect controlling where the engineering work is subsidiary and *vice versa*. In either case, the client only pays one fee to the architect or the engineer, whichever is in control.

In this country architects outnumber consulting engineers by ten to one. The proportion is probably the same in other countries such as America where, according to the Report of the recent O.E.E.C. Mission to America, consulting engineerings are used by architects to a far greater extent than in this country. It is to be hoped that negotiations between the R.I.B.A. and the A.C.E. will bring about a similar result, which will be of benefit to the client as well as to the two professions.

The International Field

In the ever-widening world markets it is inevitable that the success of British engineers should be challenged. In the Commonwealth, many countries which had been brought up to look on the mother country as their natural source of supply now encourage open competition for their engineering requirements. Moreover, when funds are made available for engineering projects through the World Bank and other organizations, it is usual for such projects to be open to international tender.

British engineers, whether consultants, contractors or manufacturers, are not afraid of international competition, provided it is fair and the tenders are on a comparable basis. A major step to this end was taken last year when the 'International Conditions of Contract for Civil Engineering Works' was signed in Zurich. It was the result of some five years' joint effort by the *Fédération Internationale des Ingénieurs-Conseils* (F.I.D.I.C.) for the consulting engineers, and the *Fédération Internationale de Batiment et Travaux Publics* (F.I.B.T.P.) for the contractors.

To attain the agreement of twenty-six nations represented in the two Federations on a document of this nature was no mean achievement, and its introduction has been welcomed by administrations the world over, including the World Bank.

It contains 73 clauses and is in two parts—Part I lays down the conditions which are common to all contracts of this nature. Part II deals with conditions of particular application, those which will vary with each particular contract. Like their British forerunner the International Conditions define the 'C.C.C. relationship' between the client, consulting engineer and contractor, laying down in precise terms the responsibilities of each party. They nominate 'The Engineer', so that the firms tendering know who will be responsible for supervision of the work, and for adjudicating on claims, a point not without its bearing on tender prices. In case of eventual dispute there is a clause providing for arbitration by the Board of Arbitration of the International Chamber of Commerce.

The Package Bid

Under a 'package bid' the contractor undertakes to supply a complete project, that is to say his contract covers the design, manufacture, construction, erection and handing-over as a going concern of the plan for a given price in a given time.

To assist British contractors in putting forward a package bid, where tenders are required in this form, the Association of Consulting Engineers entered into an agreement with the Export Group of Civil Engineering Contractors by which the consulting engineer could act for a contractor or group of contractors in getting out designs for the works and assisting generally with technical advice.

This collaboration has worked well in several cases during the last few years, but it would seem that the package bid is going out of favour in international tendering in preference to the client's use of consulting engineers in the normal way.

Spearhead of the Export Drive

We consulting engineers are frequently told that we are the spearhead of the export drive in this country. You, Mr. Minister, have more than once made this point in discussions with the Board of Trade Advisory Council on Overseas Construction. You have also been good enough to give us an occasional pat on the back for our efforts in that direction. I hope the figures I gave at the beginning of this discourse may merit another.

Let us see how this spearhead works. It is pointed at administrations which

contemplate undertaking some major engineering work, such as a new port, hydro-electric scheme, railway electrification, steelworks, chemical works, paper mills or the like. We have seen that the first step in the consideration of such a project is a project report. It is usually assumed that a favourable project report, covering a British design, incorporating British materials, standards and components, will give a certain bias to the order being placed with a British firm. In such a case, I can assure you, Sir, there will be no lack of effort on the part of British consulting engineers to be first in the field with the project report. But—and this is an essential condition—the report must be fair and unprejudiced. It must not be written as sales propaganda.

Such reports are, of course, usually submitted to and paid for by the client—that is, the administration which is considering undertaking the project. It is significant that the World Bank, when asked for a loan for such works, frequently insists on a project report and estimate by an independent consulting engineer being submitted by the intending borrower. There is no reason, therefore, why a contractor or a group of contractors should not call on consulting engineers for a project report on any scheme in which they are likely to be interested. If the report is favourable, they can then use it as the basis of their approach to a prospective customer, and such collaboration could be very profitable to British export trade.

But what if the client has not asked for any project report? The consulting engineers' Code of Practice does not permit him to solicit references, and we are not in the happy position of contractors of being able to go out and seek business.

We are sometimes told to 'come off our high horse', and waive these niceties of professional etiquette for the good of the country and its export trade. Obviously there are ways and means of getting over such difficulties and they are actually under discussion at the present time.

But the timing of the project report is of the greatest importance. Foreign competitors frequently get advance information before we do. Sometimes the machinery upon which we largely rely to obtain it, through our commercial counsellors and attachés in foreign countries, seems to suffer from restricted intake, delayed injection, failure in transmission or other troubles with which mechanical engineers can sympathize. We have welcomed recent opportunities of discussing these with foreign service officials during their periodical visits to this country.

Conclusion

In conclusion, it is hoped that this resumé of how the consulting engineer's services can best be utilized will serve to sharpen the spearhead of this country's attack on the export markets of the world. The drive behind that attack may safely be left in the hands of our leaders of industry. They may rely on the active support of consulting engineers not only with technical advice for their project reports and designs, but also in drawing up conditions of contract which make tenders fair and comparable, and in seeing that these are fairly administered.

In the exercise of his professional skill and judgement the consulting engineer

has an important contribution to make, not only to the national economy but to the amenities and happiness of the community he serves, which in the long run can mean to the peace of the world.

DISCUSSION

THE CHAIRMAN: I should like to exercise the Chairman's privilege of beginning the discussion. Mr. Tritton said that the package bid was going out of favour. I was very surprised to hear that. That is not a question, so much as a comment!

If, by the ethics of his profession, Mr. Tritton cannot advertise, how are engineers ever going to get their services known abroad and even at home? Mr. Tritton did touch on this point by making a plea that the officials of the Foreign Service and the Trade Commissioners should tell engineers about opportunities, but I should like him to say a little more about what could be done in that direction.

THE LECTURER: I confess I rather had my tongue in my cheek when I said that the package bid was going out of favour. The package bid was very largely an American effort, which came into favour directly after the war. Until the war the American economy had such an enormous internal market that it did not have to worry very much about overseas markets. Then after the war their contacts created openings of which they wanted to take advantage, and with typical American verve and know-how they worked up the package-bid system. Of course, it is a very effective bit of propaganda to go to a Chief Engineer of some big concern and say, 'See here, if you want a new power house, we can fix it for you and have it running within three years'; and the engineer says, 'That's fine; we do not have to worry about anything—we just pay and we shall have a new power house in three years'. But it did not always work out quite like that in practice. I could quote the case of an Administration which had entered into such a contract and found that when it got half way through the stipulated period there was nothing to be seen on the site but a lot of equipment and active preparation. Asked why nothing was happening, the contractor replied that all the money was spent, and that more was necessary before the work could go on. I think this was quite an exceptional case, but its effect was to show that the package bid is not always as attractive as it is made out to be.

The Chairman asked how we could get our services known abroad when we are not allowed to advertise. We are, of course, allowed to do corporate advertising (I am doing so at this moment, I hope!). For example, we read papers before professional institutions. But we rely very largely on our commercial attachés, and consuls and officials abroad, to give us the tip when there are jobs coming on. They can do much to sell our services as an invisible export. The other means I see of getting ourselves known abroad is through our contractor friends. When you see attractive pictures in the technical Press of new bridges and works overseas, you will always find the contractors' names prominently displayed in the caption. The best contractors, of course, also give the name of the consulting engineers, when they have actually done the designs and supervised the work, and we are very grateful for such acknowledgment.

MR. A. POWIS BALE: As a chartered mechanical engineer I should like to ask Mr. Tritton what he considers to be the minimum amount of money in a contract which would economically justify the employment of a consulting engineer?

The Kingston By-pass is probably known to everybody here. At the one end of it there is a series of roundabouts which were so tricky to negotiate at one time that everybody used to call them the 'Silly Isles'. Their awkwardness was realized, and alterations were made. Other operations were begun, because cars running into the old Portsmouth Road were dazzled, and that involved raising the ground on the roundabout. But the final and worst thing (to the ratepayer) was that recent floods

revealed that the level was all wrong. That means that there were three alterations. It seems to me that if a consulting engineer had been employed by the Surrey County Council in the first instance the ratepayers would have been saved a considerable amount of money. Therefore I shall be very interested in your answer to my question.

THE LECTURER: Mr. Powis Bale's first question comprises so many variables that the answer would best be given by an electronic computer! The advantage of using a computer is that it throws the onus of getting the correct answer on to the questioner, who has to feed the right premises into the instrument. If Mr. Bale has difficulty in this he can always call in a consulting engineer, whose advice may save him from entering into an unremunerative contract, in which case the answer to the question would be zero or even a minus quantity! I agree that the 'Silly Isles' should have been designed to avoid flooding and with adequate traffic signs. If a consulting engineer had been brought in at the beginning of the layout, he would have called for adequate data of flood records in the catchment area and designed his storm drainage and pumps to suit. But it is very difficult to say how much the County Council and the ratepayers would have saved if they had employed a consulting engineer with sufficient foresight at the start to avoid these difficulties.

MR. E. A. DILLEY (Taylor Woodrow (Overseas) Ltd.): With regard to the American use of the package-deal form of contract, it is my experience that it does not operate in the way Mr. Tritton has suggested. In no case have I personally come across a job where they have run out of money halfway through. If we are looking for overseas business then I am sure that we should not look upon the method in this way. It is my opinion that contractors should advertise all their works and, further, I think they should seek work jointly with consulting engineers. Would Mr. Tritton agree with that?

THE LECTURER: I may have exaggerated a little for the sake of emphasis, but I was quoting an actual example, which I came across in India. The time of the contract was half expired and there was really nothing to show for it! I fully agree with the suggestion that we can get together with the contractors to put forward a package bid on a sound basis, where this is required to meet foreign competition.

MR. G. VIVIAN DAVIES: I, too, should like to refer to the package type of contract, also known as the 'turnkey job', and would not agree with the lecturer that such forms of contract are not so frequent now. I have had some experience of dealing with American contractors, and their tendency is not to use consulting engineers at all. There are American contracting groups who have actually set up consulting divisions to do their consulting work. Well, there are now some British firms who set out to do exactly what the Americans are doing. What happens in such cases? Does the contractor instruct the consultant instead of the consultant instructing the contractor? One other question: has anyone ever thought of a way of cutting down the tremendous time lag between the announcement of a scheme and a scheme starting to go ahead? You see an announcement of a scheme, particularly an overseas scheme, and perhaps four or five years afterwards they get down to doing something about it. In the meantime everyone spends a lot of time on it which is not always paid for.

THE LECTURER: In this country, when the consulting engineer collaborates with the contractor, the usual form is for the contractor to approach a consulting engineer, whom he selects either through the Association or by individual preference. He says, 'We should like to put in a bid for this new harbour. Will you do the design for us? Not a full design, but a tender design, in sufficient detail to allow us to work out a price and put in a tender'. That is a perfectly orthodox form of procedure. The only condition is that the consulting engineer must be paid his professional fee for the design. His fee must not be dependent on the contractor getting the job. Of course, we must not overlook the fact that, where this procedure is adopted, the consulting

engineer cannot very well carry out the supervision of the work because he cannot act for the client as well and thus have two masters—it has been done, I know, by special arrangement in one or two cases, but only by prior agreement.

With regard to cutting out the delay between the signing of a contract and the starting of the work: the usual procedure (preliminary designs, acceptance of the designs by the client and instructions to proceed with final designs, getting out the conditions of contract) takes generally a year to eighteen months. People have sometimes said, 'Look here, we are in a hurry for this job, we cannot waste time getting out contract documents and specifications'. *Waste* time indeed!—All experience goes to show that in the long run time is *saved*, not *wasted*, by careful preliminary consideration of all the problems, and by seeing that our design does meet all requirements.

MR. JOHN T. CALVERT, M.A., B.SC., M.I.C.E. (Chairman, Association of Consulting Engineers): I should like to say how much we appreciate Mr. Tritton's having put forward our point of view so well. If I may make two comments: firstly, I think the best advertisement is a job well done. Secondly, in a lecture of this type, especially by someone of Mr. Tritton's wide experience, the large spectacular works, particularly those abroad, tended to receive the most publicity. It should therefore be borne in mind that consulting engineers in this country deal with an enormous number of smaller jobs such as a humdrum sewage works or even the examination of a car after an accident, and that the Association of Consulting Engineers covers the whole engineering field from the smallest to the largest schemes.

MR. J. LLOYD OWEN: We have heard a great deal in this country in recent years about outmoded nineteenth-century organization at the Trade Union level. We have heard of the carpenters and joiners, the plumbers and fitters, the screwers in and the screwers out; of the dreadful results of the demarcation disputes. I believe we are suffering from the very same trouble in the field of building and contracting. At the top we have the architect; then come in succession the consulting engineer, the quantity surveyor and the contractor. Unluckily the matter does not stop there. The clients—the Government, the L.C.C., the County Councils—they, too, think they must have their architect, their engineer and quantity surveyor, and the two sides have a grand time keeping tags on one another. What is the result? Delay and cost. I suggest that in the twentieth century we can no longer afford this multiplicity of crafts.

I think I am right in saying that in America the quantity surveyor is practically unheard of (*vide* Section 4 of Anglo-American Productivity Council Report on Building). I am not certain what the position is in Germany but I strongly suspect that the quantity surveyor is unheard of there as well. Their work—much of which is unnecessary—is done in these countries by the engineering or contracting organizations using cost-accounting methods.

If we are to meet our 'enemies' on equal terms we must cut out the architect on jobs like Waterloo Bridge, and cut out the quantity surveyor on jobs like the building of Ministry of Supply factories. We must further, as far as we can, cut out the duplication on the client's side, and set as our goal a situation in which the engineer and contractor have merged, and full reliance is placed on their skill. (This will mean fixed price contracts and proper costing by contractors.)

THE LECTURER: I should like to give another lecture on that! I am not sure that I agree that the quantity surveyor is practically unheard of in America, and I certainly do not agree with putting the contractors on a line below the consulting engineer. I pointed out in my lecture that the consulting engineers and the contractors have a common objective in producing the best possible job for the money. I do not know quite why one person calls him a customer and the other a client. I was told once

that a customer has to be satisfied if he is to remain a customer, but a client (from the Latin derivation of the word) is one who clings or hangs on in the hope of getting something more for his money! But they are often the same person. The consulting engineer is not the natural 'enemy' of the contractor, nor is he superior to the contractor; we each have our part to play, and are bound by the same conditions of contract.

MR. LLOYD OWEN: I am sorry to have drawn a red herring over the trail! My suggestion is that we are organized on a craft basis, and we must reorganize on an industrial basis and cut out the delay and shilly-shallying.

MR. R. W. TODD: If I may be permitted a comment rather than a question: my interest lies in contracting work overseas. I was very interested to hear Mr. Tritton's comments on the impartiality of the consulting engineer operating between the client and the contractor, particularly since he mentioned the Iraq road programme which has been mentioned in many newspapers in the past week. Some here to-day may not be aware that in Iraq they have had seven major contracts with contractors of five nationalities, who have all borne very severe losses. In part, the contractors attributed their losses to the fact that the programme was not handled by a consulting engineer. They claim they had ill-prepared and badly administered contracts, they did not receive drawings, they did not receive instructions, the work was held up and in particular the conditions of contract were most inequitable. I was pleased to hear Mr. Tritton emphasize the importance of the international conditions, because these are what matter to the contractors who are working overseas.

THE CHAIRMAN: It now falls to my lot to move a vote of thanks to Mr. Tritton for his admirable address and for so helpfully answering the questions. I ask Sir Alfred Bossom to second the motion.

SIR ALFRED BOSSOM, BT., LL.D., F.R.I.B.A., J.P., M.P. (Chairman of Council): It is appropriate that a sincere vote of thanks be extended to Mr. Tritton, and I have great pleasure in seconding the proposal. Mr. Tritton said, quite rightly, that consulting engineers cannot advertise; and, belonging as he does to one of the most important groups of British professional men, this obviously is correct. But reading his paper before the Royal Society of Arts, and dealing with the situation as he has, means that it will all be published in our *Journal*, which goes round the world to several thousand Fellows; and though this obviously is not advertising, it does spread the news of what can be done, and the advantages to be obtained, by retaining a consulting engineer.

I should say from personal experience that consulting engineers are much more frequently retained in America than they are in England. Practising as an architect as I did in the U.S.A. for many years, I saw the consulting engineer in his element. It would be a good plan if here in England we more frequently called them in to find out more exactly what the problems under consideration demanded, which in turn would reveal what the client himself desires. Most professional people know how seldom the client, be it the Government, the County Council, or any body for that matter, knows in detail what is likely to be the most satisfactory answer to the problem at hand, so it is with real pleasure that I do congratulate Mr. Tritton for placing before this gathering such a clear picture of the services that are available for the benefit of the client and the community as a whole.

The vote of thanks to the Lecturer was carried with acclamation and, another having been accorded to the Chairman on the proposal of Sir Alfred Bossom, the meeting then ended.

LARGE SCALE ORGANIZATION AND CHANGE: A STUDY IN OIL MARKETING

A paper by

CHRISTOPHER T. BRUNNER

*A Director of Shell Mex and B.P. Ltd., read to
the Society on Wednesday, 10th December, 1958,
with Sir Arnold Plant, Sir Ernest Cassel Professor
of Commerce, University of London, in the Chair*

THE CHAIRMAN: This is a country which lives by importing. We as a population could not survive, and certainly could not maintain our material standard of living, without importing, and among our indispensable imports the one which has recently enjoyed the most spectacular growth in importance has been oil. Because of the ever-continuing problem of paying for our imports there is naturally a special need to ask whether our methods of marketing and distributing oil in this country are as efficient as they can be. To me as an academic observer the oil industry is one of particular interest because it is one in which for ten years from 1939 to 1949 the pre-war companies were merged together into the Petroleum Board, in which all trade marking and differentiation of products were abandoned. Under the Petroleum Board we had the pool system, and from about 1949 we turned back to private trading on a competitive basis. The interesting question is, which of those two methods of operation provides the greatest efficiency. To take only one minor part of the industry, petrol, there are some people who tell me that if you buy the appropriate grade nobody can tell the difference between all the proprietary brands. There are others who tell me that they will risk going miles with an almost empty tank in order to obtain that particular proprietary brand which they believe is so much better than the others. I know nothing about the truth of these matters, but it is interesting that in recent years there has been developing some return to the pool in that we are now increasingly having bulk distribution systems through what Mr. Brunner would call 'solus' filling stations.

I do not know the answers to these questions myself, but I think there is a good deal to be said for the view that the qualities of oil that we get to-day might never have been achieved if there had not been a return to private competition.

I am sure those present would agree with me that we could not have a better expositor of this subject than Mr. Christopher Brunner. I knew him a long time ago as an academic student of economics in Manchester. Since then he has had a lifetime of real practical training and experience in this very field of marketing oil products, and I suppose it is true to say that to-day he is responsible for the distribution of more oil in this country than any rival director of marketing. If I am wrong about that he will correct me, I know.

The following paper, which was illustrated with lantern slides, was then read.

THE PAPER

I. INTRODUCTION

Great attention has been paid in recent years to improvements in the efficiency

of manufacturing industry and of agriculture. It is sometimes assumed that it is much more difficult to achieve similar improvements in distribution and in the service industries. This, I believe, is wrong and I hope in this paper to show how one large-scale enterprise engaged in marketing and distribution has greatly improved its efficiency. The particular subject of study is a company marketing oil in the United Kingdom.

II. OUTLINE OF THE MARKET FOR OIL IN THE UNITED KINGDOM

The process of marketing oil is not particularly complicated. Oil products are taken over by the marketing company either ex refinery or at the point of import if they are not home-refined. Thereafter it is the business of the oil-marketing company to transport them, store them, sell them, and deliver them to customers.

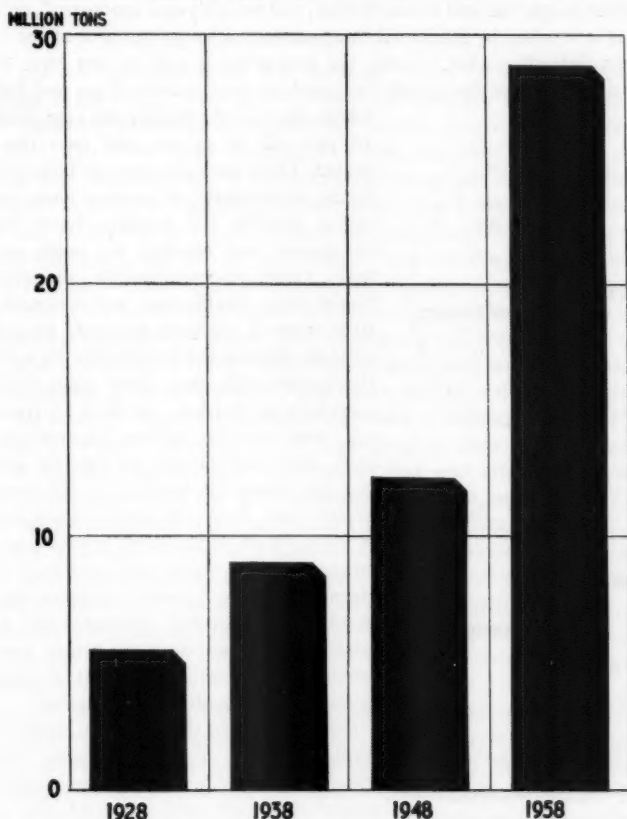


FIGURE 1. *Inland consumption of petroleum products in the United Kingdom*

The transport and delivery of oil within the United Kingdom is partly undertaken by water, partly by railway and partly by road. Where the quantities concerned are very great, transport may be undertaken by pipeline. The main function of an oil-marketing company from an operational standpoint is to store liquids in tanks, to pump them from one tank to another and to move them. The delivery to the customer usually consists of pumping the oil from a company-owned tank, carried on a vehicle, to a customer-owned tank.

The British market for oil products has been expanding rapidly for some years, and whereas it increased from $5\frac{1}{2}$ million tons to 9 million tons between 1928 and 1938, by 1948 it had increased to nearly $12\frac{1}{2}$ million tons and by 1958 to rather over $28\frac{1}{2}$ million tons. The last decade has thus seen by far the largest increase.

To most people 'oil' still means 'petrol', and twenty years ago 'petrol', or 'motor spirit' as it is called by British oil men, accounted for 54 per cent of the United Kingdom 'inland' market. To-day the proportion is only 22 per cent. This is largely a reflection of the greatly increased use by industry of gas and fuel oils,

whose share of the market has increased from 16 per cent to 48 per cent over the same period. There have also been striking increases in the consumption of aviation fuels, burning oil or paraffin for portable home heating equipment, and bitumen for roads and airfields. Other products include lubricating oil, liquid gases, paraffin wax, and feedstock for a wide range of chemical products such as detergents, plastics and insecticides. By and large the market falls into three main divisions, according to end-use: oil used by transport, e.g., road vehicles, railway locomotives, aircraft, ships and tractors; oil used by industry and the home for heating, or for providing energy; and, lastly, oil used as a raw material to form a part of the final product, such as bitumen, white spirit and petroleum-based chemicals. There is every indication that the trend towards greater diversification of oil products will continue in the future, and that provision must be made for it in planning to meet the expansion of the market.

Oil marketers in the United Kingdom, who employ a total of 38,000 people, and of whom some half-a-dozen majors with their subsidiaries and affiliates hold the lion's share of the business, have had to face rather a special problem. They were one

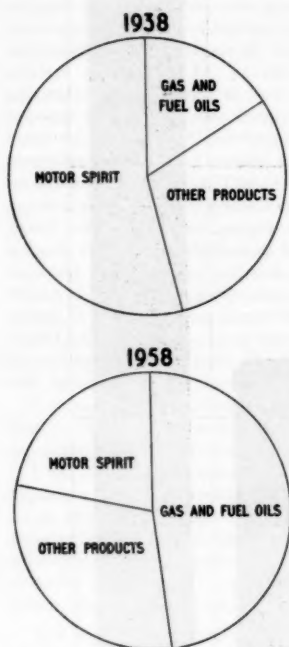


FIGURE 2. *Inland consumption of petroleum products in the United Kingdom: change in relative proportions*

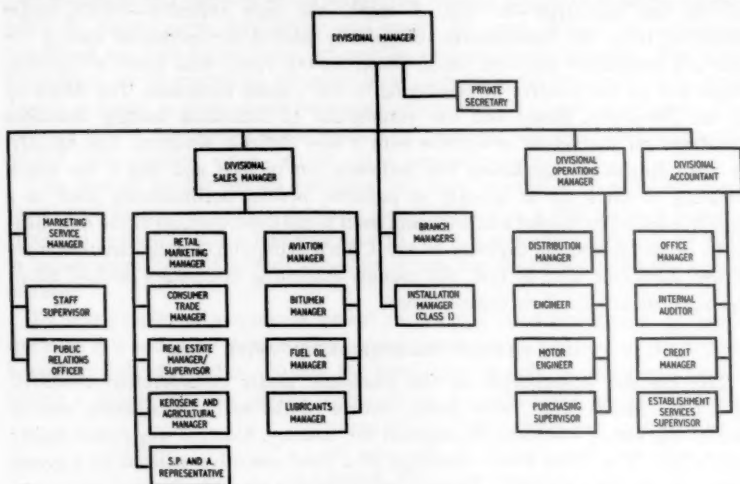
of the few industries—in fact, I think, the only industry—which, under direction from the Government, completely pooled its operations during the war and immediate post-war years. Thus, for ten years, with minor exceptions, there was no competitive oil marketing in the United Kingdom. The break-up of the Petroleum Board and the resumption of individual trading therefore faced the oil marketing companies with a very difficult situation. Put bluntly, in 1949 British oil marketing was seriously out of date and had a ten years' time-lag to catch up as quickly as possible, besides acclimatizing itself to a rapidly expanding market and adjusting itself to the consequences of the establishment of an oil-refining industry in the United Kingdom. In the circumstances it was inevitable that at first the various marketing companies should adopt the 1939 model for their organizations.

III. COMPANY REORGANIZATION AFTER 1950

The pre-war organization of the Company under consideration consisted of a large Head Office, with direct control of the main installations and of twenty marketing Divisions throughout the country. Control was rather highly centralized. The Head Office consisted of a chief executive assisted by a group known as 'the Management'. Some members of this group had specific functions with regard to particular departments from which they had originally graduated; others had no specific functions, or had assumed functions which belonged to them by tradition rather than by any ruling. There was duplication between the various members of the Management, and personality counted for a great deal in the influence they wielded. Below them were Group Managers who acted as interpreters of Head Office policy to Divisions and of Divisional views to Head Office, and a number of Head Office Departments, each with its Manager and each responsible for some particular product or type of activity, but again with some duplication. These Departments exercised a somewhat detailed control over the Divisions. Nobody had ever attempted to draw up an organization chart of this pre-war structure, and nobody had ever attempted to draw up terms of reference for any job. The organization had 'just growned', like Topsy.

The actual marketing was, apart from a few big buyers, undertaken by the Divisions. These had a staff of a Divisional Manager responsible in particular for its sales results, usually three Assistant Managers who were based on the Divisional Office but whose functions were divided geographically, and an Accountant. Then, as now, most of the accounts were kept by Divisions. Further down in the Divisional Office hierarchy there were a number of product specialists.

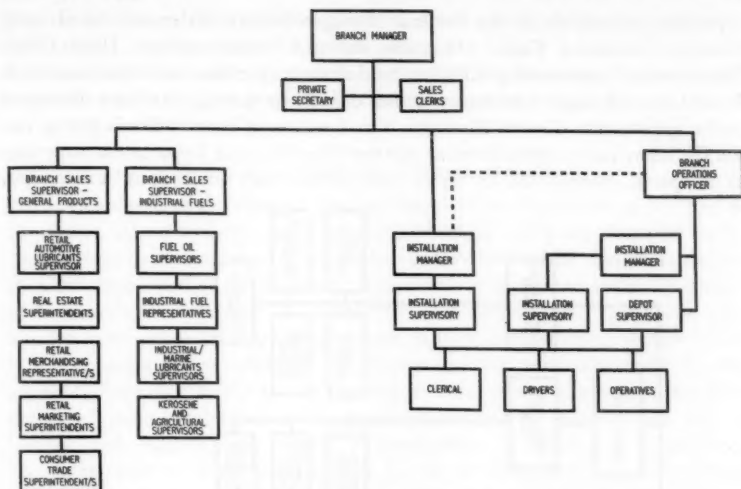
The bulk of the selling was undertaken by general-line salesmen in the field, responsible to the Divisional Manager and supplemented by a comparatively few specialist salesmen who had been appointed to deal with particular problems or especially difficult products. The general-line salesman, in addition to his selling activities, normally looked after one of the depots, although in the larger towns there was more than one salesman to the depot—there were nearly 400 of these depots. It was not a particularly tidy organization, but it had worked well

FIGURE 3. *Divisional organization, 1958*

in the pre-war years, was looked upon as progressive and commanded an enormous amount of loyalty among the staff.

It was obviously necessary to make radical changes to deal with the growth in the scale and complexity of the market which had in part already taken place and which was expected. The old organization had reached the effective limits of what could be undertaken by centralized control and had become prolific of paper work. The 'reorganization' was put in hand in 1950, and leaned rather heavily for its inspiration on the patterns of marketing which had been developed during the previous years by the Shell Oil Company in the United States. It might reasonably be claimed that the back-log has now, in 1958, been overtaken and that the company has kept abreast of the new developments in oil marketing made since 1950. Furthermore, it is believed that the present pattern could efficiently cope with a very much greater volume than it does to-day. The reorganization was not entirely empirical; it was related to certain principles which it is believed are valid for all large companies, certainly for all large marketing and distributing companies.

The first problem was to build up the Divisions into strong units to which it would be safe to decentralize. The Divisions were accordingly immediately reduced in number to ten and subsequently to nine and the status of the Divisional Manager was correspondingly increased. Basically he was made responsible for all company activities of every kind in his area. The Divisions still remained the accounting units, but the accounts departments were fully mechanized and the maximum possible use made of the punched card system. Instead of a number of Assistant Managers under the Divisional Manager, a regular pattern of

FIGURE 4. *Branch organization, 1958*

Divisional Management was set up under him, consisting of a Sales Manager, an Operations Manager and an Accountant. Certain other officials also reported direct to the Divisional Manager, of which the Marketing Service Manager was perhaps the most revolutionary appointment. Under the old system, all the Product Specialists and Operational Specialists in the Divisional Office had been in the habit of collecting one, or more often several, clerks round them and of spending much of their time in their offices administering their little departments. All these non-accounting paper-work activities were swept up into one Marketing Service Department under a competent Manager, and no excuse was left for the specialists not to get out into the field where they were supposed to be and where their real usefulness lay. Under the Divisions a new layer was introduced, the Branch. The conception of the Branch is essentially that of a field headquarters for fighting troops, and its work will be described in more detail later.

Coming back from the Division to Head Office, a similar allocation and clarification of functions took place. The Managing Director is now assisted by two working Directors, one responsible for Marketing and the other for Finance. Reporting to the Director-Marketing are four General Managers, responsible respectively for Supplies, Operations, General Sales and Industrial Fuels; a General Manager-Finance reports to the Director-Finance. There is one other General Manager, the General Manager-Administration, who is responsible for staff, establishment services, organization and methods, legal and public relations matters, and who reports to the Managing Director.

Farther down the line are Group Managers, each responsible for certain Divisions, who report to the Director-Marketing, and two Sales Managers

reporting respectively to the General Manager-General Sales and the General Manager-Industrial Fuels. Otherwise the staff consists of the Head Office Departments representing different products or specialist activities, and each headed by a Manager who reports either directly or through the Sales Managers to the appropriate General Manager. The function of Head Office is not to run the Divisions but to direct them on matters of policy, each Department according to its special interest, and to tender them advice both solicited and unsolicited.

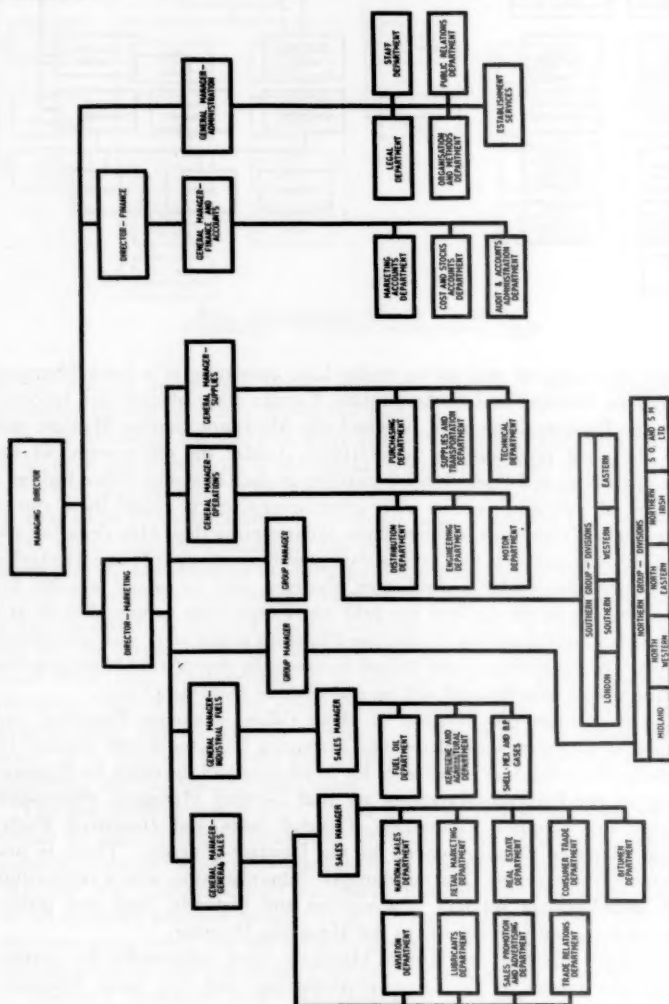


FIGURE 5. *Head Office organization, 1958*

The Division must carry out policy but need not accept advice; however, it is the Division's responsibility if it rejects advice.

I should like to be able to say with my hand on my heart that the 'new look' company organization has cut out all unnecessary paper work. It has not, but it has greatly reduced it.

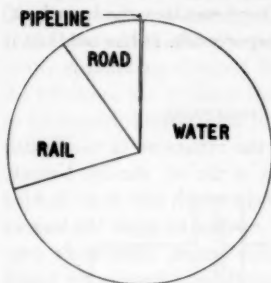
IV. REORGANIZATION OF PHYSICAL OPERATIONS

In any account of the changes brought about by the expansion of the British oil market, operations, that is the physical handling of the oil, should, I think, come before the selling of it. The problem in this field which had to be tackled after the dissolution of the Petroleum Board was in essence to apply the lessons of large-scale manufacture to distribution. In manufacture, small-scale production gave way to batch production; this in turn, in those industries for which it was appropriate, was replaced by mass production with conveyor belts and assembly lines, and this is paving the way to automation. Similarly in handling liquids; liquids required in small quantities are moved in containers such as bottles, tins, barrels and drums, corresponding to small-scale production; liquids required in large quantities are moved in tanks by water, rail or road, called respectively tankers, tank barges, rail tank cars and road tank wagons; this corresponds to batch production. Finally, liquids required in very large quantities, such as water, are moved in pipes, corresponding to mass production and offering scope for automation. In the case of oil in the United Kingdom, a few mainly speciality products are at the container stage; the bulk of the business is at the tank stage; where the traffic is sufficiently heavy to justify the capital cost, which is only in a comparatively few cases, the pipeline stage has been reached.

Taking the bulk of the business, which is at the tank stage, the economics of distribution are very much on the side of the big tank as against the small tank. There is little difference in the man-power requirements and a great difference in the quantities distributed if big tanks are used. To the extent that is practicable, therefore, oil should be stored in big tanks, which means concentrating the storage at a few fairly large depots rather than spreading it over many small depots. This was achieved by the company under consideration by reducing the number of storages from nearly 400 to 93, in spite of the increase in trade. Even this is not the end of the road. The present total includes a large number, both of brand new and of totally reconstructed storages; these have more up-to-date equipment, are more economical in man-power, give immeasurably better working conditions, and of course accomplish a much quicker turn-round of the tankers, barges, rail cars and so forth which feed them, and of the road vehicles which draw from them.

In the same way that oil should be stored in big tanks it should also be moved in big tanks; this means using water to the greatest extent possible. Few customers, however, are able to take delivery by coastal tanker or by barge, and only a minority have their own railway sidings. The problem therefore is to move the oil from the refinery or the ocean installation, if the customer

TO SECONDARY STORAGE



TO CUSTOMER

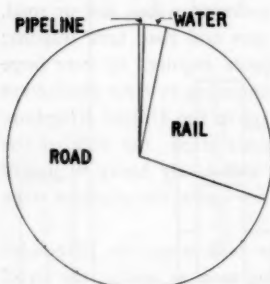


FIGURE 6. *Movement of Company's products*

is too far away for direct delivery, preferably by water to a depot within a reasonable distance of his premises; if there is no water, then by road or rail—whichever is the cheaper. The final delivery to the customer, unless he has his own railway sidings, must be by road, and here the general principle is that, provided the customer is able and willing to buy in sufficiently large quantities, the bigger the road tank wagon which makes the delivery the better. A cardinal point of policy must therefore be to encourage the customer to instal a big tank and, when he has done so, to persuade him to take a big drop. A sustained attempt has been made to get larger tanks on to customers' premises, and this has met with quite a measure of success, but a great number of big tanks are needed and also something of a revolution in traditional buying habits. This is because in the past many garages carried only minimum stocks and relied on the oil companies coming to their rescue with a 'fire-engine service' when their stocks were at danger level. Ten years ago, for instance, only one-third of all garages had a storage capacity of more than 5 tons, or 1,500 gallons. Naturally this gave rise to small deliveries, peak periods of demand around the week-end, and slack periods in the middle of the week, all of which make for uneconomic distribution.

The move towards bigger vehicles has been very striking since oil marketing began to take on its 'new look'. In the company which is the subject of this study, the average carrying capacity of its bulk vehicles has increased by 64 per cent over the past eight years. This is by no means the end of the road, and full advantage has yet to be taken, both of the increase in the permitted size of the vehicle tanks to 4,000 gallons capacity, and of the permitted maximum speed of heavy motor vehicles, which has been raised from 20 m.p.h. to 30 m.p.h.

All this expensive new capital equipment must be used intensively, if its full economy is to be obtained. Accordingly, great efforts have been made, and with some success, to organize as much of the distribution process as possible on a two-shift basis, including the double-banking of motor vehicles and of the hours during which the main storages stay open and do business.

Another striking departure from previous practice has been due to the recognition that in any very large organization there is a tendency for an undue

amount of effort to be diverted into various ancillary activities such as repairs of various kinds. It is often wise to contract out of these activities and to let the company concentrate on essentials. An extreme expression of this principle would be 'never do a job yourself which you can pay someone else to do for you'.

This policy has been carried a long way, perhaps most notably in the field of motor vehicles repairs, a big item for a company which has the largest 'C' licence motor vehicle fleet of any commercial organization in the country. Likewise, drums and barrels are reconditioned by specialist firms, and the painting of customers' pumps and service stations and all maintenance and repair work on them has been taken over by contractors. Similarly, public hauliers now undertake a large proportion of the road transport of petroleum products in bulk between refineries and storage points, that is, where the driver-customer contact is not important. Another example, which will be dealt with under the heading of sales, is the handling of the 12 per cent or so of the company's trade which could be described as 'small and messy business'.

V. NEW SALES ORGANIZATION AND POLICIES

To match the reorganization of the distribution system, changes had to be made in the traditional organization of the sales force to deal with the 'new look' situation. First, the reduction in the number of depots and the size of those which remained necessitated a complete break between sales and operations in the field. This was in line with the company's present policy of what it calls 'stripped marketing'. The salesman is no longer in charge of a depot and he has no control over the depot and driving staff; the majority of the latter have become solely transporters and deliverers of products and have little customer-contact function and play no part whatever in sales. The salesman to-day usually works from his own home, although a few are based on the Branch Offices. The greatest change has, however, resulted from the growth both in the size and complexity of the market and has taken the form of the virtually complete specialization of the sales force according to products or other definable spheres of interest, so that several men are operating for different purposes over the same territory.

Duplication of calls on customers is avoided by making every customer the responsibility of one specialist salesman according to the principal product bought, and holding that salesman responsible for all sales of any kind to that particular customer. The old general-line salesman would usually at any given time be doing well with some of his products and not so well with others, but he always had an alibi for poor results in any one direction, in the amount of time he was having to devote to other products, usually to those in which he was more successful. The specialist salesman has no alibi; he has just one job to do and he is either successful at it or not successful. In a very competitive market, it is found that this way of organizing the sales force produces the best results, although it is still the case that in a few thinly populated areas the old-time general-line salesman continues to hold his own.

The Branch has replaced the Division as the immediate manager of the sales

force. The company now has forty-four Branches compared with the original twenty Divisions and, taking account of the increase in the volume of trade, the Branch is to-day a larger sales unit than was the original Division. It controls fewer salesmen, it is true, but each salesman is expected to bring in a substantially greater tonnage of business. The sales function of the Branch Manager is essentially to get the best out of his sales team, and he is assisted by two sales supervisors. One of these is responsible for retail marketing representatives dealing with the garage trade, for consumer trade representatives dealing with commercial consumers of motor fuel who buy direct from the company and not through garages, and in addition for the various types of representatives handling lubricating oils. The second sales supervisor controls the work of the fuel oil supervisors, industrial fuel representatives (something of a misnomer, as their main duties lie in the domestic heating market), and kerosene and agricultural representatives. This system provides for quite a small number of salesmen to be managed by each sales supervisor, rarely more than twelve or fourteen, and makes it possible for the salesman to maintain close contact with his immediate manager.

Although the salesman is immediately and directly responsible to his Branch Manager and sales supervisor, the Product Manager in Divisional Office is responsible for the sales of his products throughout the Division. This brings the Product Manager into a close and direct relationship with all specialist salesmen throughout the Division selling his product, and involves him in visits to them in the field and in guidance to them on matters of policy. This type of situation always presents difficulties. In a sense it can be represented that the salesman has two masters, his Branch Manager and his Product Manager. On the face of it, this is true, but it is the old problem of 'staff' and 'line' which occurs in every large organization. The 'line' responsibility for the management of the salesmen rests quite clearly with the Branch Manager, who is responsible if the sales force in his Branch is not achieving the results required by the company. The 'staff' responsibility for any product rests, however, quite clearly with the Product Manager concerned in the Divisional Office. The 'line' and 'staff' concept needs a great deal of explaining, and much practice is required to work properly by this method, but under present circumstances there is no alternative to it.

A particular effort has been made to reduce the paper work handled by salesmen and by the Branches for which they work. Although the individual salesman is responsible to the Branch Manager, he nevertheless deals at first hand with the appropriate Product Manager in the Divisional Office so that messages and correspondence, if any, pass direct, without going through unnecessary processing at the Branch Office. Similarly the salesman has immediate access to the Marketing Service Department at Divisional Office. Such returns as he has to make, he makes to them, and Marketing Service Department send him the sales statistics they issue, with a copy to the Branch Manager. He is also permitted to call on the Divisional Marketing Service Department to draft or write letters he needs to send.

The principle behind everything that has been done since the company's reorganization is that the really important people in its service are on the one hand the small group at Head Office that initiates policy, and on the other the salesmen in the field who get the business and the operational people who make the deliveries. Everybody else is in the nature of an intermediary whose only justification is that he helps one or other of these groups to perform their function more smoothly or efficiently.

The pattern of the market has been modified in several respects over the past eight or nine years. The background throughout this period has been one of intense competition between powerful and heavily-backed groups. Several companies have been pressing hard to increase their market shares. In addition to this, the growth of a large-scale British refining industry has made it imperative for the marketing companies associated with the refineries to keep a certain balance between their sales of different products. The efforts of the larger companies have accordingly been directed towards achieving what might be described as the maximum degree of built-in stability in their own marketing outlets, each one trying to ensure a long-term relationship with his own customers and so to maintain the balance of his sales between products in the proportions suited to his associated refineries' programmes. There has therefore been a particularly strong drive to sell certain products which the refineries tend to produce in excess of demand, and also an intensive drive to find new markets for certain parts of refinery production.

The effort by individual companies to achieve built-in stability has been very clear in the motor spirit market. If the refineries' main programme of supplying a growing demand for fuel oil for industry is to be realized, it is inevitable under existing refinery techniques that a large quantity of light fractions and especially of motor spirit should be manufactured concurrently. Various factors, including high taxation, inadequate roads (particularly in the United Kingdom) and the trend of commercial vehicles towards derv fuel, make it difficult in Western Europe to sell the quantity of motor spirit which is manufactured in consequence of the large fuel oil production; and this creates some degree of im-balance in the West European market compared with other parts of the world. Retail sales of motor spirit through garages only amount to 17 per cent of the United Kingdom's inland oil consumption, but this provides almost the only shop window available to oil-marketing companies for bringing their brand names before the eyes of the public. Proper retail outlets for motor spirit undoubtedly have a great value in, so to speak, putting an oil-marketing company on the map. In consequence of all these considerations there have been great changes in the pattern of the garage market.

The traditional retail system for motor spirit in the British Isles was of multiple brand representation at each garage. This was extravagant, both as regards time spent by the salesmen and in terms of operating expenses. The retail system which was gradually developed by all the marketing companies soon after they obtained their release from the Petroleum Board was to try to persuade the garage operator to 'go solus', that is to say, to throw in his lot with one or other

of the marketing companies. From the marketing company's point of view, this meant a more stable outlet, the opportunity for making a more powerful visual impact on the public, and the certainty of operational economy through making deliveries in much bigger drops. The dealer gained by his station being improved in appearance, by his being able to call on the company for help and protection, and by sharing the operational economies. This type of relationship between the companies and the garage operators was strengthened over the next few years by the fairly general adoption of long-term contracts. In a number of cases, although a much smaller number than is often supposed, the oil companies have themselves built new stations, mainly in areas in which the housing and general traffic development have outrun the service given by the existing outlets. In spite of all these changes it is a true but surprising fact that, even to-day, with considerably more than twice the car population of 1939, the total number of petrol stations is only 100 more than it was then. The reason is that every year hundreds of small sites go out of use; these are usually sites which are not suited for handling trade under to-day's conditions. The majority of them are old sites with swing-arm pumps serving vehicles which have stopped in the street. As traffic gets denser, this practice becomes a nuisance and even a danger.

It is, however, not only in the sphere of the retail trade in motor spirit that the pattern of the market has been changed. In the direct consumer trade in motor fuel and in many other products, there has been a very great development indeed in contracts. There were of course plenty of contracts before the war, but there are many more now and a substantial proportion of them are of fairly long duration. This is the basic method of building stability into a market, and in particular it has to some extent the effect of stabilizing market shares.

There has been one other major development in the company's marketing methods caused by change and growth, and this is in a section which is not in general susceptible to long-term contractual arrangements. There has been a contracting out of about 12 per cent of the market, consisting mostly of 'small and messy business', to some 150 authorized distributors, the majority of whom were already operating other businesses in their localities and had powerful local connections. This section of the market consists of farmers, buying mainly tractor fuels and lubricants, of the burning oil or paraffin market, and of the many thousands of small users of gas oil, both for power and for space-heating. This trade does not fit easily into a pattern of a few large and concentrated storages and big vehicles; it requires the local touch and much of it is highly seasonal and best serviced by people whose activities enable them to handle seasonal labour. The authorized distributors are under long-term contracts with the company and mostly work from company-owned depots, mainly from small ones which were originally closed under the reorganization scheme.

VI. CONCLUSION

I have tried in this paper to give an account of the changes which have taken place in a large-scale marketing and distribution organization during the last

decade and of the thinking which underlay these changes. Throughout, the endeavour has been to follow the principle of what the Americans call 'straight-line thinking'.

This has entailed the recognition of certain underlying concepts. The principles of de-centralization, specialization and simplification have been applied wherever possible. 'Bigger and better' has been at the root of the planning for depots, tanks and vehicles, and the principle of never doing yourself something which others can do better and cheaper has been reflected in the policy of contracting out.

Somewhat similar developments must undoubtedly be faced by every large undertaking in this field which seeks to take advantage of modern equipment and modern techniques to increase its efficiency. It is not, of course, claimed that all the problems have been solved in the company which is the subject of this study, but at least it is now fairly clear how they should be tackled.

DISCUSSION

THE CHAIRMAN: I am going to take advantage of the privilege of the Chairman myself to raise two or three points to open the discussion. Mr. Brunner referred to the big recent changes in internal structure of his organization, in a world in which the problems to be faced are continually changing, and as I understand his exposition, for the ten years that the Petroleum Board was running the industry it was fully extended in holding the position. That was a condition of exceptional difficulty of supply and it would not be in any way a criticism of the Petroleum Board to say they did the best they could with the organization which they had at their disposal. Mr. Brunner has suggested that after ten years' interval it was a very great advantage to the private companies that they had also been operating in other parts of the world not subject to the same stringencies and therefore had a great deal to learn from the kind of adaptation which they had been able to try out in other parts of the world. By that I do not suppose him to mean that you can take the constitution of a company operating abroad and apply it here; it is simply that the companies were enriched by their overseas experience and could apply it when tackling the very different problems of this country. In other words, there is no one perfect administration chart. There are certain basic principles which can be ascertained in the course of evolution and with which all must comply, but I should not like to think that if Mr. Brunner were run over by a 'bus tomorrow Shell-Mex and B.P. would go on just the same without his unique personality in a particular position. Personality must be reflected to some extent in all organization, and where one man's capacities are unique it is important that his sphere of operation should be adjusted to make the full use of his qualities. So I hope we shall not gather from Mr. Brunner's paper that there is one best organization for even Shell Mex and B.P. when personalities change. A second problem raised by Mr. Brunner was that of getting rid of excess paper-work in any large organization. He said that the implementation and circulation of standing orders had been largely improved by the use of loose-leaf books of standing orders. Well, there is also the receiving end of this, of which I have had a little experience. It is one thing to issue frequent and necessary amendments to standing orders. It is another thing to make sure that every adjutant in every company office of the army is systematically and promptly inserting or pasting them all in his copy! A permanent secretary of one of the big service departments said to me about three years ago, 'I am just doing something I am sure you will approve of. I have announced in my service that all existing standing orders will cease to have effect on the

31st December next—the whole lot—unless they are individually confirmed as being vitally necessary orders by senior officers'. And I said, 'What do you expect to gain from this?' and he replied, 'I think from the 1st January we shall be managing with about 15 per cent of the existing standing orders and we shall be very much better off for that'. This proliferation of new orders in loose-leaf covers, with the risk of people not making all of the consequential amendments on the other pages, is one of the great diseases of a large organization.

The third point I want to refer to is this very interesting example of a man serving two masters, each person being subject to staff instructions from product managers and to line instructions from his sales manager. I want to study carefully the printed text of this arrangement to see how far I personally will agree with Mr. Brunner about it. I should have thought that in large industrial companies to-day the tendency is to say there is only one line of management, and that is line management. The staff people are specialists who prescribe. They have the right to offer and the duty to provide prescriptions to the people who are involved in handling matters in which they are concerned, but it must remain the function and responsibility of the line man who receives those prescriptions himself to decide whether on occasion he will ignore them. The condition is that when he ignores them he tells his superior precisely why. I suggest to you that it is initiative and eagerness to take responsibility down the line which keeps an organization really on its toes.

I am very interested in the development in this 'liquor trade' of the 'solus' retailer. There is a fascinating parallel between the liquor trade and the petroleum trade. I can see the great advantages that come from a big drop in one filling station instead of half a dozen small drops into the same filling station. But I can see also this: there are five or six major companies; and I ought to say that for three or four years I was a member of the Monopolies and Restrictive Practices Commission. It would be an awful pity if the Christopher Brunners of twenty years from now, trying to develop new oil distribution companies, found that all the filling stations were tied, and that their new and perhaps 'better-if-it-were-given-a-chance' oil-distributing organization could not get into any of them. My anxiety is that licensing may be applied to oil-filling stations as it is by licensing magistrates for pubs. You know how many people are saying, 'We cannot have all these stations along the main roads; how ugly they are, let there be a control of them'. Well, if there were licensing controls on the establishment of new stations I am quite sure that the five or six major companies would soon have most of the existing ones tied 'solus' to them; and where then would the new competition come from? Well, this is a shocking thought to be prompted by a paper for which I have so great an admiration, but I should just like to ask Mr. Brunner one further question on that. I realize the advantages of this system in many places in order to get economy in oil distribution. Is there a tendency at the same time for the other services which these garages provide—the car components and spares, the ancillaries, tyres and so forth—to be limited in variety, so that you have to go chasing from one station to another before you can get the replacement of the kind that you prefer? Is there going to be a complete freedom in distribution of the ancillaries whatever specialization may be necessary for the petrol and oil?

THE LECTURER: Dealing first of all with the organization, I hope I did not say anything against the Petroleum Board. I think it did a magnificent job. The pre-war inland consumption of oil was 9 million tons a year in this country. At the peak of the war effort it was at a rate of over 22 million tons a year. It was not, therefore, a question of consumption being cut down—it was enormously increased to take account of the R.A.F. and other commitments. With regard to taking blue-prints of foreign organizations and applying them here—of course, one does not do just that. Naturally you adapt any model you see, and I should like to make the point that no organization

is static. Little changes are being made all the time which one hopes are improvements, and each organization, if it is to survive, must modify in order to deal with the changing circumstances in which it has to operate.

The next point, about loose-leaf manuals and the army man who said, 'Scrap the lot'—so far as business is concerned, I think you keep your instructions to an absolute minimum. You pull out all the pages which are no longer relevant and have the new pages put in, so that instead of turning up something and finding it has been superseded, you are able to turn up one complete and up-to-date manual and see what the position is now.

With the business growing in complexity and the need for new skills to cope with it, the line manager obviously cannot know everything about everything. Therefore he has to have help from the 'staff' man, whom we call the product manager and whose position is not one of issuing commands but really one of giving advice. The advice does not have to be taken, but woe betide the person who does not take it and is wrong!

Lastly, the tied house. With regard to the services which we call T.B.A.—tyres, batteries, accessories—the company I have been discussing has stated that it is not, and will not be, part of its policy to exercise any control over the lines carried by the operator, but that it will advise him if its specialists think that there is any falling-off in quality of a particular commodity. For a new supplying company to enter the market there are certainly difficulties. It is not only a question of finding sites for service stations—this one must not exaggerate, for we are talking here about only 17 per cent of the trade. Planning the sites for refineries and installations is becoming much more difficult, since in a small country like this the available land is limited and much of it has already been utilized.

On many main roads, the licensing of service stations is effectively in being now. The Ministry of Transport is vetoing the putting up of new stations because of the interference with traffic which would be caused by an increase in the number of points at which traffic joins or leaves the main road. In other areas the Ministry of Town and Country Planning has given notice that it will not allow new stations. So the available area for siting new stations in this country is, I think, continually diminishing. Many of the new sites are, of course, concentrated in new housing areas.

THE CHAIRMAN: I think everybody will agree that Mr. Brunner has effectively disposed of me.

MR. A. POWIS BALE: I am a chartered mechanical engineer. On this question of distribution by large tank wagons, it seems to me that smaller wagons have considerable advantages in urban districts and may I ask if you ever divide your large tank wagons into two or more compartments? My second point concerns service to the ordinary motorist. I was astounded when I was in Perth, Western Australia, to find the service to the ordinary motorist was rather better in the Shell branch there than it is in England. There may be a good reason for this?

The last point is that Shell-Mex and other companies have been hammering home the use of these high-grade petrols by advertising. They have a very good reason for doing so; these high-grade petrols must be used up, otherwise you get an unbalanced production. Now would it be possible for companies to issue to people with old cars (that is cars with a low compression ratio) a season ticket which enables them to buy the expensive petrol, lighter petrol, at a cheaper price?

THE LECTURER: I do not personally agree that there is an advantage in using small vehicles in towns, because if you compare, say, a 2,000 gallon vehicle and a 4,000 gallon vehicle, you have got to use two of the smaller vehicles and fill up the roads

with them instead of one of the larger. You are merely adding to the traffic congestion thereby. Providing you can get on to your customers' premises you do better to use the larger vehicle. With regard to the number of compartments in a vehicle, you cannot have just one tank in a vehicle, whether it is small or large, since you would have a tremendous amount of slopping of liquid whenever the vehicle was in motion. In fact, the law provides that no compartment should exceed 800 gallons.

I am afraid I have no experience of the Shell service in Perth, Western Australia, and, therefore, cannot comment on it. With regard to the high-grade petrols, it is not in these that there is an excess of supply, but rather in the lower grade petrols.

MR. G. VIVIAN DAVIES: What is going to happen to all the sales representatives when Mr. Brunner turns over to long-term contracts? Will they suffer the fate which, it appears, is going to be the ultimate fate of man, not to be killed by the diseases which killed his ancestors but to become redundant? A certain American oil company which must be nameless built a refinery here, and then found that all the principal filling stations were tied up on long-term contracts, and they had no outlet for the products of their refinery. So they had to go round the country, select and buy suitable sites; it took them a very long time to do that, and now nearly all their filling stations are owned by the company to which I refer. As a motorist I should like to ask Mr. Brunner what his company and the other big distributors can do to make the average 'service' station live up to its name and give the motorist a little service? The servicing a motorist gets on the Continent is incomparably better than he gets in this country. I will give an example. In certain garages in Switzerland you can wash your hands, there is a place where you can eat and have a cup of coffee. That good service will pay in this country, a friend of mine who took over a filling station in Herefordshire, and put these ideas into practice, proved. He made so much money that he retired very quickly! I asked, 'Don't you lose a lot of towels and brushes and that sort of thing?' He said, 'Yes, I do; but that is a drop in the ocean compared with the extra trade I get'. At his station all the hands who served you at your car had little money bags, and did not have to go a hundred yards to a cash till for change, and back again. There were three points where air for your tyres was provided, so there was no need to wait in a queue for that. When your tank was filled, a little device which Shell-Mex supplies protected your wings from getting petrol-splashed. The windscreen was always cleaned and so on. That is what the public want. How, Sir, are you going to give that sort of service?

THE LECTURER: About your first point: we have been putting more and more people on long-term contracts over the last ten years. I have still never had a good salesman made redundant. My sales managers are always wanting more, not less, salesmen, and I think there is very little likelihood of anybody with any ability in that field finding himself redundant. I have a lot of sympathy with your complaints about the service at filling stations. We are doing our best, and we think we have improved the service over the last few years. But this is not a problem that is confined to any particular branch of activity in this country. Getting good service has been extremely difficult since the war in all phases of our service industries, having regard to full employment. But the general standard is better than it was five years ago.

DR. A. PARKER, C.B.E.: I was interested in the charts of organization shown, but of course I know that charts on paper are not the practical result, which in the end depends on the individuals who occupy the positions. I should therefore like to ask what steps are taken to select suitable people for the responsible jobs and whether there is any watch for young people of rather more than average ability to ensure that they are getting responsibility at an early age? In so many old organizations the impression is prevalent that no man under 30 can take any responsibility, forgetting

that if a man is not given responsibility before he is about 35 or 40, he will never be able to take it.

May I also ask what steps are taken to give service to the non-motorist consumer; I mean the people who buy oils in bulk for central heating in their houses and for industrial purposes of various kinds?

THE LECTURER: Six or seven years ago we established a fairly large training centre where people are given their chance on courses, and are watched over and their abilities assessed. Those concerned take a very close interest to see what sort of score employees get. There are also reports on everybody, which indicate their potentialities for further development. The Career Development Manager, who was appointed some years ago, keeps an eye on all this, and has the job of finding talent at all levels; and, having found it, of making sure that it is given every chance, through training schemes and job rotation, to reach its maximum potential development.

In a highly competitive market like ours, each company endeavours to give better service than the others. I should be interested to hear of any direction in which we could extend that service. We have a large technical staff able to advise industrialists on their problems. With regard to home-heating, I would point out that we supply the fuel and not the heater. When there are faults in a car, surely we must blame the car manufacturer rather than the petrol supplier.

MR. M. D. H. ROSS: There are two matters which I find of particular interest. First, Mr. Brunner said they took the man based on a local station, and who was also a general salesman, and completely degutted his job. From being a local personality, he became a nobody, and I should have thought that this was a serious blow against his prestige and against his confidence? Now I wonder how such men took it? Then, these big changes of organization and staff. In a happy industrial life how are these difficulties got over? We have not heard anything about this at all. It is so easy to describe how changes should take place, but getting people to do them seems quite another matter. One has to take into account personalities and so on.

It seems to me to be very interesting that whereas you used to have general salesmen who called upon one man, you now have product salesmen who have to sell everything to the man they call on. I cannot see the difference between your general salesman who used to sell everything to Mr. A., and the new product salesman who calls on Mr. A. and has to sell everything to him now.

THE LECTURER: Certainly there were frictions caused by the reorganization, which possibly in some cases may have lasted two or three years. But having got it going, the new system has been running very smoothly now for about five years. You cannot make any big change in people's lives or functions without friction, but if you have to get an organization working properly, you must be prepared to face that.

The product man is a specialist who has special knowledge of his product. If Mr. A. is mainly a buyer of fuel oil, he is called on by a fuel oil man with a proper background, having technical training and certainly technical knowledge, to help the customer with any fuel oil problem. If, in addition to that, he buys 5,000 gallons of motor spirit a year, then the approach is, 'What about your motor spirit, Mr. A?' The function of such a man is very different from that of the old general salesman, who did everything, including running the depot, and a great deal of paper work, and was responsible in principle for all products of all kinds in an area.

THE CHAIRMAN: I am afraid I must now interrupt what I think could be a very prolonged and spirited discussion. I am sure that you would wish me to offer Mr. Brunner very sincerely our thanks for all the work that he has obviously put into preparing this very informative paper. Those of you who have had experience in preparing papers of this kind will know that they are not accomplished in a few

nights, or just dictated to a secretary. There is an enormous amount of work involved, and the care with which it has been done here means that there is going to be a printed paper which all of us will wish to read and study at leisure, again and again, in the future.

The vote of thanks to the Lecturer was carried with acclamation.

SIR PHILIP SOUTHWELL, C.B.E., M.C.: I have very great pleasure in expressing the thanks of all present to Sir Arnold Plant for taking the chair. We have been most fortunate to-day. Professor Plant has an international reputation in the spheres of industrial practice, materials and management problems, and I am one of the many here who hoped that this meeting might go on another hour or so, so that we could have had the advantage of more of his provocative observations and questions, which stimulate discussion. We have indeed been fortunate that he could spare the Society his valuable time to-day.

The vote of thanks to the Chairman was carried with acclamation, and the meeting then ended.

LAND UTILIZATION IN THE COMMONWEALTH

A paper by

L. DUDLEY STAMP, C.B.E., D.Sc., D.Lit., LL.D.,

*Director, World Land Use Survey, read to the
Commonwealth Section of the Society on Tuesday,
16th December, 1958, with R. O. Buchanan, M.A.,
B.Sc.(Econ.), Ph.D., Professor of Geography, The
London School of Economics and Political Science,
in the Chair*

THE CHAIRMAN: My duty, a very pleasant duty, this evening is to introduce to you your speaker, Professor Stamp, though in fact there can be few speakers who less need any introduction to an audience in this Society. In his own subject, Geography, his fame is international, and he has amply fulfilled his early promise. As a mere babe he had achieved the degree of D.Sc. of the University of London, and while still hardly beyond the crawling stage became a full professor in an overseas university. His rise to the top of his profession was meteoric in its speed; but, more than that, having got there, he displayed the sustained brilliance that few of us ever achieve. In the particular context of his lecture tonight—his interest, I think, probably dates from his initiation of the Land Utilization Survey of this country. There had been a few unorganized exercises in field work mapping of land use by odd parties of university students, but it needed the insight and the foresight of a Stamp to see the possibilities of making that exercise nation-wide, and of getting the work carried out to a common pattern throughout its whole radius. I should not like to hazard a guess as to how many thousands of people from local authorities, universities, training colleges, schools and other interested individuals he enlisted in that programme. Suffice it to say that every field that exists in this country was mapped on the six-inch scale on the ground, and then the raw material of those six-inch field sheets was reduced (by what I should think was the first team of professional geographers ever employed in this country outside universities and schools) for publication on the one-inch scale. That great series of land utilization maps created during the 1930s stands as an historic document comparable to the Domesday survey, but vastly easier to use in that the precise aerial boundaries of the categories are there on the maps. That series of maps was completed by a series of monographs on counties and, finally, by what was probably the biggest single contribution to the geography of this country since Mackinder's day, *The Land of Britain*.

Professor Stamp has recently retired from his post in the London School of Economics and he is using his additional leisure—if, indeed, he has any—to enlarge that programme to a world land-use undertaking. The problem is not merely different in magnitude, it is different in type. The kind of difficulty that was experienced in getting uniformity of treatment in Great Britain is infinitely greater when you are concerned with a world-wide survey, with maps that vary from reconnaissance maps on a scale of less than 1:1,000,000, to small patches here and there with large-scale

maps. One is tempted to think that it will need all the genius and drive of even a Stamp to bring that project to a successful conclusion. In the meantime, however, we are to hear tonight a progress report of some of the characteristics of land use in some of the territories of the world, notably those within the Commonwealth.

The following paper, which was illustrated with maps, was then read:

THE PAPER

I

Despite the innumerable and urgent problems of the moment which claim public attention, it may be urged that the greatest long-term problem before the world to-day is the rapidly increasing pressure of population on land resources. The earth's land area is fixed and can only be increased in what, by comparison with the existing area, are infinitesimal amounts, to be measured in acres rather than square miles. There are no new lands to be discovered as there were even a couple of centuries ago, no vast new fertile lands to be opened up by settlers on virgin soil as there were even a century ago. The actual area of every country is known with considerable accuracy—now even the extent of Antarctica.

By way of contrast the world's population, estimated at 2,850,000,000 in December, 1958, is increasing at a net rate of about 1·3 per cent per annum, or more rapidly than ever before in the earth's history. This rate of increase, derived from latest United Nations sources, means an addition of 40,000,000 mouths to be fed (and pairs of hands to work) every year, or over 100,000 a day. The world adds to itself a population equal to the whole of that of New Zealand in less than three weeks, or equal to the whole of that of Australia in 3 months or that of Canada in 5 months¹.

The phenomenal present rate of increase does not reflect, in general, an increased birth rate. In fact, birth rate is dropping in many countries. It is due to the fact that the knowledge and practice of 'death control' have overtaken the knowledge and practice of birth control. Diseases which a few years ago were killers—such as yellow fever or pneumonia—are now to a very large extent under control; vast areas have been rid of scourges such as malaria; in civilized countries death in child-birth is almost a thing of the past, whilst expectation of life for a child at birth has been more than doubled in many countries over the past two or three decades.

It may be of interest to speculate what may happen in the more distant future with a population doubling itself every 47 years²: if this were to continue, in a couple of thousand years—a short span even in terms of human history of the past—there will be standing room only.

In the meantime, however, the pressing problem is feeding the increasing numbers as well as providing the other many and varied needs of peoples with a rising standard of living.

II

The existing pressure of population on land is very uneven from one country to another, and within the bounds of most of the larger countries there are

likewise striking and often unexplained contrasts. The pressure of population on land and its consequences may indeed be studied at four levels. In the first place there is the global level, the ability of the earth as a whole to support population. Whilst it is possible to make various calculations suggesting what total population could be fed at existing levels of output or existing techniques, the global view has a theoretical rather than a practical significance. An analysis of the world position does, however, afford a yardstick against which any given country or region may be measured. The second level, perhaps the most important, is the national or country level. Not only is there the great contrast between the 'haves' and the 'have nots', but it soon becomes clear that political, economic and even scientific thinking has been and still is conditioned to a very large extent, even if unconsciously, by the national background. In the field of land use the right answer in a land of wide open spaces may be, indeed probably is, the wrong answer in a crowded country where land is in short supply. The third level of study is the regional level within a country; the fourth and final is the local level—the details of land use in the area of a town or village or even a single holding.

III

Taking first the world position, its 2,850,000,000 people have a land surface of 55,786,000 square miles, or 35,703,000,000 acres, or 14,300,000,000 hectares, on which to live. The share of each human being in the land resources of the world is thus at the present time about 12 acres or 5 hectares.

Out of this total much is incapable of any permanent settlement based on agricultural production. About a fifth is too cold—covered with snow and ice or permanently frozen a short distance from the surface; another fifth is too arid and with no known resources of water; another fifth is too mountainous or too elevated, another tenth is bare rock and soilless. The 'habitable' earth's surface or 'ecumene' is thus about 30 per cent of the whole—rather less than 4.0 acres or 1.5 hectares per head³. This includes all land with adequate temperature and moisture conditions and some soil, but actually much is at present unused or little used, especially in the tropics. There are vast areas of tropical forest, for example in equatorial Africa or America, with abundant rainfall and constant high temperature which are nevertheless so devoid of population as to deserve Pierre Gourou's description of 'forest deserts'.

The figures collected by the Food and Agriculture Organization (FAO) of United Nations suggest that the land actually cultivated by plough, hoe or digging stick and primarily to provide food is about 1.1 or 1.2 acres per head⁴. On a world basis, with all the varied diets, crops, types of farming and techniques, it may be said that the produce of rather over one acre of cultivated land is required to support one human being; the proportion of cultivated land being used for non-food crops such as cotton being offset by the contribution to the larder of grazing lands (about 3 acres per head). In certain countries, of which Britain and New Zealand are outstanding examples, farming depends so largely on improved grassland that the figure for ploughed land alone is misleading and one should take the total of crops and improved grass—which is the meaning

of 'cultivated' in British official statistics and equivalent to 'improved' land in American returns.

As a basic 'world' figure we thus get the position that each individual requires the produce of 1.1 acre for production of food, that 4.0 acres are potentially cultivable out of a total of 12.0 acres.

IV

This brings us to the concept of the productive capacity of land in terms of human food and so the carrying capacity of land in terms of population. The range, even on a national basis, is very wide. The area of land required to support one human being varies according to many factors, both of production and consumption.

(a) *Diet.* Some foods are extravagant in the sense that much land is required to produce them. Meat-diets require large areas of land, whereas a basically rice-diet is very economical of land.

(b) *Type of farming.* Intensive systems of cultivation are obviously more productive per unit area than extensive systems, though the former may require much more labour. There is much confusion of thought regarding the meaning of 'efficiency' in agriculture. A crowded country such as Japan may be fully justified in measuring efficiency in terms of output per unit area; a country with abundant land but high labour costs such as the United States almost automatically thinks of efficiency in terms of output per man hour, or input-output ratio.

(c) *The physical factors affecting production.* Two of the chief are quality of land, primarily a function of soil, and climate. Obviously land ranges from the highly productive to the almost useless, though an accurate system of grading is extremely difficult to achieve. When the English Ministry of Agriculture carried out the Farm Survey of 1940-41 it published in the Summary Report 'adjusted acreages' of farms in which 10 acres of moorland or rough hill grazing were considered as equivalent to one acre of improved land—crops and grass⁶. The Land Utilization Survey of Britain under my direction drew up a scheme of classification of land in Britain into ten types; the map of Great Britain published by the Ordnance Survey for the Ministry of Housing and Local Government showing the distribution of these ten types is well known⁶. I have attempted to carry the assessment of productive capacity a little further by suggesting the use of a potential production unit (PPU)⁷. If Good General Purpose Farm Land (Types 2 and 4) is given a ranking of 1 Unit it may be that the best lands should be rated 2, the poor mountain moorland or the lowland sandy heaths as 0.1. Thus if a new town requiring 5,000 acres were sited on the best lands it would absorb 10,000 PPU; if sited on poor sandy heaths only 500.

(d) *The environmental factors affecting human consumption.* Food requirements of human beings vary with the height and weight of individuals and so with age, very widely with occupation and also with climate (rather less in the tropics). In any given country, however, one can get an average; the major point is that there will be a certain variation from country to country. With average height

and weight of the population coupled with climatic conditions, the requirement for adequate nutrition will be rather less in India than in Australia.

V

This brings us to the question of nutrition and the relationship of an adequate diet to the planning of land use. In my Presidential Address⁹ to the International Geographical Congress at Rio de Janeiro in 1956 I proposed the use of a Standard Nutrition Unit (SNU) equivalent to the production by the farmer of food representing a value of 1,000,000 nutrition calories or kilocalories per annum. Allowing 10 per cent loss in preparation (milling, cooking, etc.) this is 900,000 calories per annum for consumption, or 2,460 calories per day, which we may accept as a world standard of adequate nutrition. Provided the food is derived from sufficiently varied sources this intake of food is likely to include adequate protein* and trace elements: deficiencies when detected can be rectified. The importance of the SNU as a unit is that it is independent of the actual food—grain, meat, milk, fruit can all be converted into caloric equivalents. One can compare the productive capacity of different lands with different types of farming in terms of their output of SNU or what are really human-sustenance units.

On this basis one acre of the intensively cropped arable lands of Japan, mainly under rice and with much 2-crop or even 3-crop land will produce 6-7 SNU per annum, i.e., enough to support 6 or 7 persons, though in that case the deficiency in protein which has to be made up largely from fish is well known. James Wyllie¹⁰ has shown the intensity of effort during the last war in Britain whereby the area of land required to support one person was cut from a pre-war figure of 1.85 acres to 1.15 in 1943-4. It may be said that at present, with the varied British diet and the high level of farming efficiency, it takes rather over one acre to support one person. Curiously enough, with a very different diet and standard and a very different level in agricultural efficiency, it is about the same in tropical Africa. At the other extreme with extensive crop and arable farming, highly mechanized, in Canada each acre of improved farm land produces between one-third and one-quarter SNU. In Canada there are 4 acres of farmland in crops and grass for each inhabitant, but the land also produces a very large exportable surplus.

VI

We are now in a position to compare and contrast some of the constituent parts of the Commonwealth. It may be said at once that in pressure of population on land resources the countries of the Commonwealth embrace the extremes. Table I is a rough calculation (with the world position for comparison) for leading Commonwealth countries of the position at the present time, at the end of 1958. The calculations of output of SNU per acre, i.e., intensity of agricultural production, must be regarded as very approximate first calculations, which I have only been able to work out for a few selected countries.

* It is claimed that a balanced diet should contain 74 g. protein per day or 27 Kilograms—say 60 lb.—a year. When, however, nutrition experts go on to claim that half the intake should be as animal protein, it seems that this standard ignores the third of mankind who are virtually vegetarians.

Country	Population mn Dec., 1958	Acreage per capita			SNU per cultivated area
		Total	Cultivable	Cultivated	
World	2,850	12.0	4.0	1.1	0.75
United Kingdom ...	51.8	1.1	0.6	0.55	0.9
England & Wales ...	45.3	0.8	0.6	0.55	0.9
Canada	17.4	150.0	23.0	4.0	0.4
Australia	10.0	192.0	?	5.7	0.2
New Zealand	2.3	29.0	18.0	1.1 (8.6)*	
India	400	2.1	1.0	0.95	0.75
Pakistan	86.5	3.0	1.0	0.7	1.0
Ceylon	9.4	1.8		0.4	
Hong Kong	2.8	0.09	? 0.03	0.01	? 10.0
Singapore	1.77	0.08		0.02	
Malaya	6.8	4.8		0.8	
South Africa	14.5	21.0		1.5	
Rhodesia & Nyasaland	7.7	41.0			
Uganda	5.8	10.0	9.0	1.0	1.0
Kenya	6.4	23.0		0.63	
Tanganyika	9.3	25.0			
Nigeria	33.3	7.2		1.7	
Ghana	4.9	12.0		2.7	
Sierra Leone	1.9	9.4			
Gambia	0.29	8.9		1.9	
Cyprus	0.54	4.3		2.0	
Malta	0.33	0.24		0.15	
Jamaica	1.64	1.7		0.26	
Trinidad	0.80	1.5		0.51	
British Guiana ...	0.53	100.0		6.5	

* The figure in brackets includes sown grasses.

This table, crude as it is, illustrates a number of points. In the first place the Commonwealth as a whole has vast land resources, not only in total area but also in cultivable areas. In the second place the extreme contrasts suggest the many opportunities for inter-Commonwealth trade and inter-Commonwealth migration. In the third place it is clear that the problems are so utterly different from one Commonwealth country to another that what may be the right policy in one country would not be in another. In the fourth place, as so often happens, Commonwealth countries share their problems with their neighbours and so can either serve as guinea pigs or, alternately, use the results of pilot schemes carried out by others. Thus many of the problems of Britain are common to north-western Europe; Hong Kong affords a sample, with pressure intensified, of conditions common to southern China; Canada shares many problems with the U.S.S.R.; conditions in British tropical Africa are common to much of the continent.

VII

The figures on which the above table are based are those published by U.N. and F.A.O., in turn contributed by member-countries, in turn collected by varied means not excluding guesses of varying intelligence. Anyone familiar with the collection of agricultural statistics will know that the accurately measured 131 acres of a given crop in one administrative unit, added to the wild guess of 4,000 in the next, will give a sum of 4,131 acres, a figure seemingly accurate, but which might easily be changed to 2,131 by someone else's guess. I could give actual examples of where this has happened. But if our knowledge of total acreage is unreliable, our knowledge of the actual situation and space-relations of the areas concerned is often almost non-existent. I come accordingly to the work and purpose of the World Land Use Survey.

THE WORLD LAND USE SURVEY

The 16th International Geographical Congress which was held in Lisbon in 1949 set up a Commission under the Chairmanship of Professor S. van Valkenburg (United States) to inquire into the possibility of preparing an inventory of land use all over the world. The Commission in due course met and issued a unanimous report (with text in English, French and German). Later I agreed to become Honorary Director of the World Land Use Survey established under the auspices of the Union to further the recommendations of the Commission¹¹. Briefly, the recommendations of the Commission and the objectives of the Survey are simple yet fundamental. They are that every country of the world should record on maps, using the most convenient scale available, the existing use, including non-use, of its land, using the classification of land detailed in the Commission Report (though with whatever subdivisions may be locally needed) so that results in one country are directly comparable with those in another. This is a factual, objective record, but is basically important for two reasons. First, it nearly always reveals a highly complex pattern of land use which is the result of the interaction of the physical factors of the environment and of man's activities right up to the present day. To understand and to evaluate the factors which have led to the present position is to understand the factors which will help to shape the future. Second, any land use planning for the future must start from the present position: nowhere is the earth a blank sheet of paper on the planner's drawing board, but a highly complex palimpsest. In a large measure planning becomes the encouragement of trends deemed, on policy grounds, to be good or of changing those believed to be bad.

The first stage then is mapping the present position, the second its analysis, the third the initiation of research needed to fill gaps in knowledge, the fourth is planning.

The great danger is to jump straight into the last stage without the adequate foundation of factual knowledge. To me the approach of the World Land Use Survey is the only logical and the only sound one.

But there are those who look for short cuts or stress one particular factor in land use. There is no doubt, for example, that a fundamental factor in land use

is the soil, hence the basic necessity of a soil survey, but it is not the only factor. The determination of 'land capability classes', I suggest, is an attempt at a dangerous short cut because it involves a subjective judgement conditioned by economic or social ideals or objectives of the moment.

The danger of a short cut is fully illustrated by the failure of the East African Groundnut Scheme. £5,000 spent on a land use survey might have saved a loss of £50,000,000.

VIII

It is obviously impossible in the space and time at my disposal to pass even in brief review the land use problems of the constituent parts of the Commonwealth. I must content myself by indicating some of the contrasts within the Commonwealth, sometimes even between regions of one country.

In the homeland it is the overall shortage of land and the clamorous insistence of so many interests—industry, housing, recreation and sport, transport (roads and airfields), defence, nature conservation, forestry and agriculture—that each in turn is the most vital, that has forced this country to adopt a comprehensive nationwide scheme of town and country planning. At the present time open land is passing to other uses at the rate of 50,000–60,000 acres a year in England and Wales, and urban uses already occupy one-eighth of the whole surface of the country¹². The position in Britain is complicated though rendered more interesting by the remarkable variety of terrain—from almost uninhabited and almost unusable mountain moorland to some of the most productive market garden land as well as the most heavily stocked pastures in the world. A scene of settlement for two or three millenia or more, Britain is rich in archeological and historical treasures whose preservation is a matter of more than local and even national importance. The future of every single acre is important and must be looked at from many angles.

IX

By way of contrast Canada is the roomiest of lands, yet already faces some of the problems of crowded Britain. Partly because it is the largest country in the world outside the Soviet Union, the problems of land use in Canada have national, regional and local angles not always compatible. On the national level there is the constant fight against distance and the need to secure access before the vast northern forests and arctic prairies can play their part in the national economy. Canada is realizing the importance of stock-taking, and the aeroplane has rendered first exploration easy, the air photograph being the most revealing of documents. Under the energetic leadership of Mr. N. L. Nicholson, the Geographical Branch of the Department of Mines and Technical Surveys at Ottawa has made manuscript land use maps of a large part of Canada's northern lands. The figure of 23 acres per head of cultivable land is the estimate made officially by the Canadian Government of land which could be brought under cultivation with application of known techniques—given the pioneers. Canada's problem in the northward extension of agricultural land is the length of the growing season, as it is in Siberia. Yet in the Maritimes and the east Canada may already be facing the

New England problem—abandonment of land cleared at great effort by early settlers yet showing itself economically submarginal for cultivation in present world conditions. But an investigation of the land use pattern in New Brunswick carried out by Miss Margaret Cunningham as a Beaverbrook Scholar working under my guidance showed cropped land almost unrelated to soil or quality of land, but stretching into the forest from the access roads to a depth determined primarily by the energy of the farmer. But Canada also illustrates two other principles of world-wide application. For a given expenditure on fertilizer the return is greater from intrinsically good land than for marginal poor land: the prosperous farmer is to be found not on the pioneer fringe but in the accessible good lands. Yet these are the very lands vulnerable to urban expansion. Round the western shores of Lake Ontario, Canada has a unique strip of fruit country rapidly disappearing; Toronto is sprawling and wasting good land in an alarming way, and Greater Vancouver threatens to swallow up the most fertile lands in all British Columbia.

X

Australia is a unique example of a land which was, when white settlers arrived, more truly virgin than any habitable land on earth. The aborigines neither cultivated the land nor tended herds; if they occasionally started bush fires, at least as many were doubtless started by lightning or other non-human causes. The early geological isolation of the continent had led to the establishment of a highly specialized and distinctive fauna and flora in delicate balance. In turn each of the introductions of the settlers has upset this delicate balance—one need only mention rabbits and prickly pear. In the third edition, recently published, of Wadham and Wood, *Land Utilization in Australia*¹³, Sir Samuel Wadham demonstrates the fluctuating tide of public opinion which has played so large a part in the development of land use in the continent. At first the inhospitable land, fit only for a place of banishment, then the Eldorado and the land of limitless opportunities and inexhaustible riches consolidated by the creation of the Commonwealth of Australia in 1901. The publication of a volume actually entitled *Australia Unlimited* epitomized a mood that lasted till the '20s, and it is worth while reading Griffith Taylor's autobiography¹⁴—he was almost literally hounded out of Australia for emphasizing the problems of the desert heart and uninhabited tropics—to see what extravagant claims were made at the time. To-day Australia is facing land use problems realistically. Regional and land use studies, such as those under the direction of C. S. Christian, Head of the Land Research Section, C.S.I.R.O., at Canberra, are providing basis data. At the moment Australia offers some marked contrasts between its great cities in flood tide and the many small settlements outback, which seem to stand still. Emphasis is on the lands inherently good or responding well to heavy expenditure on irrigation, and the well-watered fringe of a continent where only 2.5 per cent. of the surface is yet in improved farmland. But Australia is likely to become a battleground in basic principles of land use. The pioneer settler naturally burns and destroys. The forest is his enemy, grassland is there to be ploughed up, the wild animals compete with his flocks and herds and must be destroyed. The supreme example

of the ruthless destructive pioneer is perhaps the American who headed west, and his misuse of land culminated in the 1930s, coinciding with the great depression. The limelight was focused on soil erosion as the greatest and most dangerous scourge of mankind, and so strong has been the influence of American reaction that half the world has 'conservation services'. But as every geologist knows, erosion is nature's inevitable answer to the elevation of any land surface above sea level; it is slowed down by the establishment of a vegetation cover, for a time even an equilibrium may be established, but it is temporary. New thinking is needed: not to bemoan the loss of a few inches of soil but to build up quickly a few feet of new soil. This is the aim, most successfully demonstrated now over a period of years, of the Australian engineer-farmer, Mr. P. A. Yeomans, whose scientifically sound Keyline plan is explained in his book, *The Challenge of Landscape*¹⁵.

XI

In New Zealand we find a physical, particularly a climatic, environment approximating to that of Britain, a biological environment as unique as that of Australia. Now people of British stock tend animals of British origin on pastures of British grasses menaced by weeds—including the widespread gorse—of British importation¹⁶. Despite a population only one-twenty-fifth of that of Britain, land use problems familiar in the homeland are already appearing. There is the urban sprawl, notably of Auckland, and its integration with the countryside; there is the doubt whether the great plantations of happily flourishing *Pinus radiata* (like the exotic conifers of the Forestry Commission in Britain) are the right answer; New Zealand can match the problems of the Highlands of Scotland. The Domesday Survey of 1086 was a snapshot picture—admittedly from a curious and specialized angle—of an England changing rapidly under new masters, yet what an endless source of information and how vital a basis of comparison for subsequent changes. Is it too much to hope for a snapshot picture of present land use in New Zealand?

XII

To Pakistan belongs the distinction of being the first Commonwealth country to commission an aerial survey for the purpose of constructing maps of existing land use and at least reconnaissance soil maps as a basis for comprehensive national planning. From air photographs and sufficient ground control adequate land use maps can always be constructed. The photographs reveal much else, including indications of geological structure not easily seen on the ground, but indications of soil are limited to what manifestations there may be at the surface. In Western Pakistan the great irrigation works have rendered cultivable vast areas of the Punjab and Sind plains previously desert, but have brought also two major problems—of waterlogging and of salt accumulation. The extent of both troubles can be mapped with considerable accuracy from the air. In Eastern Pakistan the land use problems are different, but in the past much-needed expansion of rice and jute lands has been offset by abandonment of earlier

settlements. Here the new field of medical geography or the geography of pests and diseases impinges on land use.

In Pakistan, and perhaps even more in India, the problems of land use are primarily social problems. Over huge areas inherently good fertile soils starved of organic manure and fertilizer give tragically low yields which result in poor nutrition of a poverty-stricken farming peasantry, who have in consequence neither the energy nor the money to do better. The ill-nourished cattle, their laborious scratching of the land surface and drawing of water done, are valued as a source of fuel, not of protein; the goats survive through the very destruction they bring. Indian leaders are well aware of the problems, and the answer is efficient land use. If the land of India were used as effectively and crop yields were as high as in China or Japan, India would indeed be a healthy and wealthy country. The facts must be known and at the top level there can be nothing but praise for the foresight of Pandit Nehru in including a preliminary national stocktaking in the current five year plan, which has resulted in the recent publication of a great National Atlas under the direction of Professor S. P. Chatterjee of Calcutta.

Ceylon has been galvanized into action by a rapidly increasing population, and the new irrigation works are virtually replacing as well as extending those which fell into disuse—presumably because of the spread of malaria¹⁷.

XIII

Hong Kong must surely be unique. A far larger population than New Zealand—probably now 2·8 millions—crowded into a part only (for Lantau Island is very sparsely peopled) of 396 square miles. Though there is only 0·01 acre of cultivated land per head of population, Hong Kong manages to produce 30,000 to 40,000 tons of rice and half the vegetables used by its vast population. On the sandy soils from the eroded granite the refugee immigrant peasants from south China practise what is virtually a form of hydroponics, with a yield almost incredibly high. Perhaps nowhere else in the world does the old adage 'necessity is the mother of invention', stand out so clearly, and for that reason alone the potentially cultivable land is shown with a large question mark in the table. The present land use has been mapped in great detail by Dr. T. R. Tregear of the University of Hong Kong, and his report forms the first monograph published by the World Land Use Survey.

Not dissimilar is the position in Singapore, of which detailed land use maps (1:5,000) are now being prepared by the University of Malaya and published for the Singapore Development Trust. About a million and three quarters are there living on 224·5 square miles, and a large proportion of the vegetables needed are produced on the island.

Malaya as a whole is a fascinating problem in land use and notably of re-use, since alluvial stretches worked over for tin can be re-used for rice or rubber.

XIV

Turning to Africa, the Union of South Africa was one of the first countries in the Commonwealth to recognize the problem of soil erosion (in the 1920s).

Breaking the sod in the grasslands of the High Veld carries the same danger of starting erosion as in the American prairies, and hence the need of blocking an incipient *donga* as soon as it starts.

Certain land use problems are common to the whole or nearly the whole of inter-tropical Africa. In the first place much of Africa is a plateau which has been a land mass for a very long time. Its soils are sedentary soils, formed *in situ*, different in character and consequently in types of management needed from the transported soils of other lands. The typical African tropical climate, with its marked rainfall rhythm with wide variations from season to season and year to year, involves a dry season which is also a hungry season, yet the African, unlike the Indian, has never learned readily the need to conserve water throughout the year. Truly the old crystalline rocks of much of the African plateau do not provide natural storage as do the alluvial deposits of Indian plains, but Africa is even more vitally in need of reservoirs, or tanks, or other means of storage. Because Africa is essentially a succession of plateau surfaces varying in elevation, erosion is naturally very active near changes in level. Although the fertile valley plains and delta of Egypt result from erosion in the Ethiopian mountains, it is not yet appreciated that trapping eroded material to form river plains is more important than futile attempts to stop erosion in the hills. To the casual traveller, indeed to the more seasoned traveller or resident, vast areas of Africa are covered by a monotonous savanna or grassland with scattered trees. When the World Land Use Survey carried out some experimental mapping from air photographs in Tanganyika and Nyasaland it was intended to publish on the scale of 1:1,000,000. In practice it was found that the pattern of land use was so intricate that it could not be fully shown even on the scale of 1:50,000, or more than one inch to the mile. The survey revealed little fertile pockets and fully explained the failure of large-scale 'reclamation' projects which assumed uniformity of conditions over wide areas. It is now known that little if any of the savanna of Africa can be regarded as natural vegetation: annual burning destroys tree seedlings and encourages grass growth at the expense of forest regeneration. The age-old conflict in Africa between the semi-nomadic hunter or herdsman and the sedentary agriculturalist has left its mark on land use. Perhaps almost more important is the widespread system commonly called shifting cultivation, though better described as land rotation. This involves bush clearing, cultivation for two or three years, then abandonment while the land rests for a dozen years or so (bush-fallow) before the period for cultivation comes round again. It is a regular, not a haphazard system, and is satisfactory until population pressure reduces the period of fallow and land is re-used before it has rested sufficiently. Under the system a village requires five or six times the area of land under cultivation at any one time, and the position is reached when some form of regular cultivation must replace land rotation—this is the case in considerable parts of Nigeria. On the other hand the *lusuku* or garden cultivation of Uganda presents other problems. Very wisely Ghana, then the Gold Coast, set up a Soil and Land Use Survey under the late Mr. Charter, which carried out first-class survey work. At present, the Gambia has wisely commissioned the Directorate

of Overseas Surveys to prepare a series of detailed land use maps from air photographs, and the first sheets, prepared by Mr. Martin Brunt, have recently been published. They show a very intricate pattern of land use along the Gambia River and will throw light on some interesting problems. There has been recent reclamation of mangrove swamp lands for rice cultivation, yet rice imports remain high. The guess has been hazarded that there has been at the same time abandonment of dry or hill rice lands. Statistics would show a steady area under rice, the maps will show whether or not the area of cultivation has in fact migrated.

XV

We may appropriately end this review of some Commonwealth problems in land use with a reference to Cyprus. The troubled political scene has turned the limelight away from the age-old problem of land use in a country with a rather extreme Mediterranean climate—very hot scorching dry summers, inadequate winter rainfall coming in destructive cloudbursts. Yet it is a land capable of heavy production if water is controlled and the destructive goat kept in check. A land use map¹⁹ has been made under the direction of my colleagues R. R. Rawson and K. M. Sealy at the London School of Economics and published at the World Land Use Survey. A monograph on the history of land use by Dr. D. Christodoulou is in course of publication.

The crowded Maltese Islands combine the climate problem of Cyprus with the population pressure problem of Britain or Singapore. The need for a balanced approach to the apportionment of land, where the physical environment is as varied as in Britain, is well seen in the crowded West Indian islands such as Jamaica, Trinidad and Barbados.

XVI

If there is one lesson which emerges from this review of land use problems in the Commonwealth it is the need to make haste slowly. There is no substitute for the careful accumulation and interpretation of facts and the need to keep an open mind. The greatest danger lies in looking for the proofs of some preconceived theory, often brought from other lands and other climates.

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DISCUSSION

MR. W. J. GARNETT (Norfolk School of Agriculture): To what extent does Professor Stamp think that world-wide irrigation can alter those figures of land utilization he gave us?

THE LECTURER: In calculating the figures for potentially useable land I have had in mind land which could be irrigated from *known* sources of water. I have not, however, attempted to produce any final estimate of the world's ability to support population—there are too many unknown factors. In the future we may be able to use water derived from the oceans for irrigation. We have not yet started to cultivate the sea or use the great source of food which may be possible as a result. I am not one of those pessimists who believe that the starvation of mankind is just round the corner.

MR. G. B. REDMAYNE: I am farming in Hampshire, where there are anxieties over another new town which it is felt may take the best land. The farmers there have come to think that the Services do not now need so much land for training with the modern weapon that has come into use. They think that perhaps it would be possible to have a land use budget in this country every few years, just as we have a budget of expenditure every year. By that means we could try to plan the use of this country. Is that a feasible proposition?

THE LECTURER: The possibility of the land use budget has been very much discussed. The general point of view is first, let us face the overall position, the amount of land we have got, and then let us look at the requirements for land. Where the demands for one type of use appear to be excessive, they must be cut down. I think that that is constantly being done. There is pressure for example on the Ministry of Housing and Local Government and their officers to note every transfer of land, and pressure is quite rightly kept up by the Ministry of Agriculture. In the fifteen years that I was Chief Adviser on Rural Land Use to the Ministry of Agriculture, that was my constant job. I am not quite sure that the land budget idea is feasible; it is rather a question of constant vigilance. In the next few years, let us face it, much land at present open farm land will be required for expansion. The land wanted is sure to be 'the best land in the country'—at least, that is what town planners say of farming opposition! On the other hand, I do contend that present-day town planners are very timid and constantly demand almost level sites which usually involve good farm land. We should never have had the more interesting cities which our ancestors developed—in Bath or Durham or dozens of other places which are now so attractive—if there had been the modern town planners by to say, 'It is an impossible site, you cannot build on that'. It is sometimes urged now that we should use, for housing, poor quality common land; but in lowland England, at least, common land is a precious heritage. I am inclined to agree that the Services might well consider releasing some of the poor land which now appears to be surplus to their needs.

MR. A. POWIS BALE: One question about the aerial surveyor: I am talking about ordinary aerial surveying and mapping, and in that sphere immediately after the First World War we had led the world. Is our position still as good as regards the modern surveying for land utilization maps?

THE LECTURER: In recent years map-making has been revolutionized, in that the majority of large-scale maps in the world are constructed from aerial surveys: the photographs are studied stereoscopically and translated by very elaborate machines produced in different countries. One takes that as a matter of course in the construction of maps.

MR. POWIS BALE: My question really was, do we still lead in that way? Was it the British aerial surveyor who pioneered the land use survey?

THE LECTURER: Yes, Britain is certainly well to the fore—for example, there is the work of the Directorate of Overseas Surveys which is busily turning out maps of many parts of the Commonwealth at the rate of several sheets a day, or of such firms as Hunting Aerosurveys, which undertakes aerial surveys all over the world.

SIR SELWYN SELWYN-CLARKE, K.B.E., C.M.G., M.C. (Chairman, Commonwealth Section Committee): I am sure we are all 'sold' on the importance of land utilization surveys! There is just one point I should like to make. Professor Stamp referred to the very high standard nutrition unit in Hong Kong and also to the apparent lack of utilization of the land on the Island of Lantau. The Government of Hong Kong did in fact do their utmost to persuade some of the million refugees from Japanese-occupied China to go to Lantau to utilize the land there before the Pacific War. We had a number of camps on the mainland and on the island of Hong Kong itself; and there were, of course, tens of thousands of refugees lying on the pavements without any cover at all to them; but despite all efforts and these discomforts we found it extremely difficult to move any but a small handful to Lantau Island. One of the difficulties in Lantau is the water supply, and another is the poor nature of the land, except in the small valleys where the good soil has been washed down from the hills. The third difficulty is that Lantau is expensive to fertilize, whereas Hong Kong island itself, being so crowded and having rather a primitive system of disposal of night soil, is very easily fertilized with human night soil. So my question to Professor Stamp is, did the statistics which he gave us in relation to the high standard nutrition unit relate only to the Hong Kong island and perhaps the mainland and Leased Territories, omitting these arid islands which form quite a large proportion of the total land mass of the colony and Leased Territories of Hong Kong?

THE LECTURER: My figure of the land cultivated per head in Hong Kong is the average for the whole area. When I calculated the higher figure for land potentially usable, I had in mind the possibilities of using Lantau much more fully, though I am well aware of the water difficulties. By and large, the work of the new settlers in Hong Kong, especially in the New Territories, is remarkable. It is absolutely amazing the way in which some of the Chinese peasants who come in from Red China get on. Give them £5 and within a couple of years they have built themselves a brick house and have acquired three or four pigs and a radio! I actually saw cases of that sort. There is some very interesting large-scale work going on at the moment—for example, fields that have been terraced in the past but abandoned have been reterraced and it is really quite fascinating to see the drive that there is.

MR. J. P. SHORT (Geography Lecturer, North-Western Polytechnic, London): Whilst it is highly desirable that a world series of land utilization maps be made, in view of the fact that only a relatively small proportion of the earth is mapped at topographical large scales, would not Dr. Stamp agree, in advocating a world land utilization map series, that the emphasis in this present generation should rather be on getting countries to go ahead more rapidly with the trigonometrical ground survey as an absolute necessary basis for large-scale mapping and for work on the second stage, namely the interpretation of aerial photographs for land use mapping purposes?

THE LECTURER: Of course, I would agree that the need for mapping the earth's surface is very vital indeed. Perhaps things have progressed more than might appear. There is only one scale on which maps of the whole world are available and that is the scale of 1:1,000,000. In fact, there are three sets of maps on that scale. The great work of the International Geographical Union, begun just over fifty years ago, was to get every country in the world to join in production of maps on that small scale. Now that has been done and there is available a 1:1,000,000 International Map of the whole world. The Russians have produced their own series of 1:1,000,000 maps covering the whole world and there is a third series now used by air services, which

highlights various features which are of importance in air navigation. When we drew up the recommendations for the World Land Use Survey we did mention publication on this 1:1,000,000 scale for the single reason that base maps were available. We soon found, however, that for any practical work in land planning there must be larger-scale maps. So I agree that we should get on with large-scale mapping as quickly as possible, and this is certainly being done now in many countries in the world.

THE CHAIRMAN: You have been given by Professor Stamp a rapid survey of quite a large lump of the earth, of infinite variety, of varying stages of density of population and intensity of land use, each with its own type of problems. You have been given, indeed, indications in the course of that, of how very much more Professor Stamp has still got to say if the time were available for him to say it. It needs no words of mine to stress his unique knowledge and authority in this field. I think he has made it perfectly plain, even to the most unsympathetic, that there is a whole series of problems, and that the problems are urgent, but there are methods already recognized for tackling at any rate some of them and that with more basic fundamental research, more methods of tackling more problems can no doubt be achieved. I am sure you have not merely profited from the lecture but enjoyed it as well, and I would ask you therefore to convey your appreciation to Professor Stamp.

The vote of thanks to the Lecturer was carried with acclamation and, another having been accorded to the Chairman upon the proposal of Sir Selwyn Selwyn-Clarke, the meeting then ended.

G E N E R A L N O T E S

RUSSIAN PAINTING FROM THE THIRTEENTH TO THE TWENTIETH CENTURY

Visitors to the first comprehensive exhibition of Russian painting to be seen in Western Europe, which is on view at Burlington House until 1st March, will enjoy the show better if they remember that the Russians are both romantics and realists. Their paintings are chiefly statements of facts, sometimes depicted in a deliberately dramatic style. The sixteen icons spread over the first two galleries are sufficient proof. The most delightful of this series is *St. George and the Dragon*, a poetic work, of little modelling but flowing rhythms, and rare decorative qualities. This is one of the few works in which the artist seems to have thoroughly enjoyed himself. Among the other icons, there are the usual stereotyped figures, some with immense dignity. In two of the seventeenth century, however, both from the Tretyakov Gallery in Moscow, it is clear that the painters were making a personal effort to break away from the imprisoning rules of the Church. The large main figures are according to rule; but the borders, filled with enchanting miniatures, would appear to be the work of painters who are off the leash. *Virgin and Saints* by Chirin, and *The Prophet Elijah* by Kolmogoretz, will both repay careful study. The spirited individuality of the tiny illustrations, in the style of illuminated manuscripts, suggests that the artists, having done their duty as workmen, felt free to show that they were also artists.

Since the number of exhibits sent would have been dwarfed in the great Gallery III, an ingenious arrangement has been made. Nine-tenths of the gallery has been clipped off, and a false canvas wall erected. This is supported by tiny trees in tubs. The main wall is hung with five eighteenth-century portraits. They show restraint and excellence in craftsmanship. Flattery is absent. Levitsky's *Two Pupils of the Smolny Institute* are relentlessly created. Borovikovsky's *Naryshkina* is determinedly honest, when it would have been so easy to produce a smirking Greuze.

The seventeenth century goes unrepresented. The eighteenth and early nineteenth see the struggle between a few sensitive portraits and a good deal of story-telling

in paint. Nearly always there is a real sense of occasion. The artists obviously saw what was going on in some other countries, especially Britain, but not France. There is a capable bric-à-brac painter, an artist of dramatic sunsets who might have been the kin of B. W. Leader, and an *Oak Grove* that, in its own determined way, recalls the paintings of many English and Scottish artists, none of whom, however, created anything of such vastness.

Other portraits, however, call for attention. *Tolstoy*, one of five by Repin, is quite commanding. Another artist, who seems to have rolled up his sleeves in a businesslike way, is the famous Vereshchagin, who was killed at Port Arthur. His decoratively painted *Rich Kirghiz Hunter with Falcon* is wearing his entire wardrobe.

Quite suddenly, nearer our own day, under the heading of 'Soviet Art', there are glimpses of delight, though the titles needlessly emphasize the propagandist origin. *Cupola and Swallows* is living radiance. Yuon, the artist, was born in 1875, and died last year. Like all his fellows, he ignored Cubism and abstract painting, but, at least, he was a poet with a paintbrush. To capable Johanson, born in 1893, on the other hand, *Communists under Cross-Examination* is a subject for frank propaganda. He depicts the erect suspects as having obvious contempt for their crouching examiners. On an adjoining wall, the portraits of Nesterov are honest and vital. The *Surgeon Yudin* is occupied with his job, and the *Portrait of the Academician Severtsov* is penetrating and fresh.

When the propaganda is frank, the result is much better than when it is insinuated. The small painting of *Delegates from the Villages Visiting Lenin* is a succinct record by Serov. This *petit-maitre* has done a perfect job, the political leader being accepted as chief, and the workers as followers. There is a total absence of melodrama. Experimental art excepted, the Russians make a late effort to catch up with contemporary trends. Deineka, who painted *The Defence of Petrograd*, has a touch of Eric Kennington's effective matter-of-factness in his workers marching across a bridge.

The last room reverts to story-telling and frank melodrama. Millais's Brunswicker, going off to the war, is seen in reverse in the battle-stained soldier's *Return* by Kostetsky. *The Last Days of Hitler's Staff in the Bunker* (pseudonymously painted) is perfect cinema, with the wild-eyed Führer listening to the tramping Russians overhead; and the great group of equestrian peasants singing *Through Valleys and Over Hills* by Shatalin must warm the heart of all revolutionaries. By the side of this, *Transport Coming Back to Normal* (like Clapham Junction on an off day) by Yakovlev and the lorryloads of cabbages *From the Collective Farm* by Podliasky are honest illustrations. If the show is not exciting it may be sound enough for most visitors.

G. S. SANDILANDS

GOLDEN JUBILEE OF THE INDIAN INSTITUTE OF SCIENCE

In February the Indian Institute of Science, Bangalore, completes fifty years of most valuable service to the nation. Conceived and generously endowed by the late Mr. J. N. Tata, the Institute was the first of its kind in India to be established for the specific purpose of furthering advanced research in the pure and applied sciences. This intention has been amply fulfilled. Since 1911, when the first of them were admitted, more than 3,000 students have been trained at Bangalore, and investigations carried out in the Institute have resulted in the initiation of several new industries which have contributed substantially to the development of the Indian economy.

BUSINESS HISTORY

The first issue of a new learned journal, *Business History*, appeared in December. It is to be published bi-annually by the Liverpool University Press and the subscription is 30s. a year.

The appearance of a special periodical devoted to the history of business houses

reflects the interest which scholars are taking in their extensive and largely unknown collections of records. Much of the credit for this growth of interest must be given to the Business Archives Council which, since its foundation in 1934, has been engaged in the double task of persuading historians to take an interest in businesses and business men to take an interest in history. The Council maintains a register of business records and possesses a valuable library of company histories. It is also prepared to receive into its care collections of unwanted business records of historical interest and to advise the heads of business houses as to what is and is not of value. Inquiries should be addressed to the Secretary, Miss I. Shrigley, 9 King's Bench Walk, London, E.C.4.

'MERL' RESEARCH SUMMARIES

The D.S.I.R. Mechanical Engineering Research Laboratory at East Kilbride, Glasgow, is preparing a series of brief research summaries, principally to help firms with engineering interests to keep in touch with those findings of recent research which are of direct industrial significance. These summaries give straightforward accounts of work still in progress at MERL as well as the main findings of completed investigations. It is promised that aspects of the following subjects will be covered from time to time: fatigue and creep of engineering materials and components; bearings, lubrication and wear; performance of gears and other mechanisms; engineering metrology and noise control; design and performance of hydraulic machinery; heat transfer and applied thermodynamics; and machining, extrusion and other metalworking processes.

Fellows of the Society who would like to receive MERL summaries regularly are invited to write to the Director of the Laboratory at the above address.

EVIE HONE EXHIBITION

An exhibition of stained glass, paintings and drawings by Evie Hone is on view at the Arts Council Gallery, 4 St. James's Square, S.W.1, until 15th February, admission 1s.

A descendant of the Irish painter Nathaniel Hone, Evie Hone, who died in 1955 at the age of 61, was one of the most talented pioneers of the present revival of stained glass in Great Britain and Ireland. She studied as a painter in oils at first under Sickert, Bernard Meninsky and Glen Byam Shaw, before becoming a pupil in Paris of André Lhôte. Her early style is represented in the exhibition by oils and gouaches dating from the mid 1920s onwards. It was not until the early 1930s that she realized her ultimate *métier* in the art of stained glass, in which her work is characterized by rich, glowing colour and an impressive simplicity of design. Amongst the large windows shown are her *Beatitudes* and *Last Supper* for St. Stanislaus College, Tullabeg, and the *Ascension* from St. Mary's Church, Kingscourt; there are also some twenty smaller windows, including a group of purely secular works.

During the run of this exhibition in St. James's Square, the Tate Gallery is displaying, in its North Sculpture Hall, Evie Hone's 45-ft.-high cartoon for the East Window of Eton College Chapel.

LIEUTENANT-COLONEL JAMES BARRY

It is interesting to record that Lieutenant-Colonel James Barry, who was elected a Fellow of the Society at the November Council meeting (*Journal*, December, 1958, p. 10), is a collateral descendant of James Barry, R.A., the Irish artist who painted the large canvases in the Lecture Hall (1777-83). The Council is happy to renew this association with one who contributed so much to the original decorative scheme of the Society's House.

STUDIES IN THE SOCIETY'S ARCHIVES IV

NOTIONS OF ECONOMIC POLICY EXPRESSED BY THE SOCIETY'S CORRESPONDENTS AND IN ITS PUBLICATIONS, 1754-1847: (iii) INTERNATIONALISM, SCIENTIFIC 'IMPROVEMENT' AND HUMANITARIANISM*

In contrast to its nationalistic bias and its acceptance of traditional social values were the 'liberal motives' of the Society¹. These took the form of an early acceptance of the international character of scientific inquiry, an interest in novelty for its own sake and a championing of humanitarian reforms.

From its foundation the Society had exchanged publications with foreign societies and had admitted foreigners to both corresponding and ordinary membership². 'The surest method of improving Science is by a generous intercourse of the Learned in different Countries and a free Communication of Knowledge. . . . It is the business of the Philosopher and Naturalist to explore . . . [the] treasures of Nature and spread the knowledge and use of them for the benefit of Mankind. Such are the sentiments of the Society.'³ These sentiments were expressed in a circular letter sent by the Society to the naturalists of foreign countries in 1760. 'The good of mankind' joined patriotism and public spirit as a motive in letters addressed to the Society⁴, and a correspondent who concluded his Latin letter in English, to show that he was not a foreigner, admitted that 'in your liberal principles that might be no great objection'⁵. Thomas Paine was recommended to the Society as possessing 'a Genius for Mechanics that promises much Benefit to Mankind'⁶. His letter was dated 1789.

'Science ought to connect every part of the globe and though the Society of Arts has the improvement of the British possessions immediately in view, yet the liberality of its members will not, I am sure permit them to fear any bad consequences from the introduction of its improvements into other Countries', wrote an American 'fellow labourer in the cause of Science' in 1801⁷. Colonel William Tatham, writing in the following year, endeavoured to persuade the Society to forget the loss of the North American Colonies.

Let us not them prepossess our minds with weak unmanly resentments such as the spirit of Englishmen should despise; nor persuade ourselves that the mere transfer of local jurisprudence by the fate of human revolution, has changed the nature of man, or rendered him inimical to his interests in commercial reciprocity; for if this reciprocity formerly existed through the medium of mutual supply and demand nature will return to her wonted channel of wants and convenience when those prejudices shall be removed that have been opposed to her operations in the mist [*sic*] of coercive measures and misguided zeal . . . Let this Society, then, claim the honour of commencing a liberal research into the means of promoting a fair and mutual traffic; and I dare pledge myself for America. . . .⁸

Even before the Revolution there were elements in the Society which did not share the Mercantilist attitude to the Colonies. Benjamin Franklin felt that the formation of the Society meant 'that those Jealousies of her Colonies which were formerly entertained by the Mother Country begin to subside'.⁹ The Society explained to him its 'desire . . . to make Great Britain and her Colonies mutually Dear and Serviceable to each other'¹⁰. Alexander Garden, another great colonial, was told how 'They apprehend . . . that the greatest Emolument that can possibly arise to England and to its Colonies abroad is to have that Kind of reciprocal Trade between them as that the Intercourse shall greatly benefit both.' As the Colonies developed economically so would their population grow, 'for who can doubt of an Increase of Inhabitants in that Country where the Laws espouse the cause of Liberty and where Trade increases private Fortunes?'¹¹

* The first and second parts of this article appeared in the issues of the *Journal* for September and December, 1958.

In its encouragement of inventions the Society did not fail to condemn 'Old vulgar prejudices'¹² and to deplore the days before its agricultural improvements had been accepted—dark days when

Not genius yet dar'd custom's bounds pervade,
Nor generous fortune gave benignant aid
No daring mind had yet adventurous plan'd
To impress with foreign virtue sterile land.
A Yeomanry from old experience drew
But what she taught and what their fathers knew.¹³

'The Ingenuity and Industry of individuals' were to be stimulated 'by the Prospect of Gratifications pecuniary and honorary'.¹⁴ Individual self-interest was to be made to follow the public interest. Honour and wealth were to be the inventor's bait. 'A brass Farthing inscribed "The Gift of the Society of Arts"' ¹⁵ would content a landowner who had spent extensive sums on tree planting and, although the politeness of the age inhibited a direct reference to the desire for wealth, one correspondent at least was frank enough to ask 'your advice how I may best proceed to hold the said contrivance for my Own Benefit'.¹⁶

An advocate of air travel writing in 1811 voiced the usual complaint of the misunderstood inventor and suggested the rôle which the Society was expected to play.

It not unfrequently happens that persons advancing any new Thesis on speculative points run the risk of being considered at best enthusiasts, and it is not until after fair trial they become acquitted in the public opinion, it is not for the million to distinguish the nice shades which sometimes divide the useful from the absurd; it becomes the business of Societies such as yours to mark those distinctions to cherish the tender germ of Science.¹⁷

For, as one of the many designers of perpetual motion wrote in 1841, 'who can say he has reached the Boundary in any Direction?'¹⁸

That an enterprising spirit was not incompatible with practical benevolence was shown in the letters of Joshua Steele, a vice-president of the Society who, when over 70, settled in Barbados, introduced startling reforms in the management of his slaves and founded a Barbados Society of Arts. In 1783 he wrote describing the efforts of the Barbados Society in the field of poor relief: 'I hope no illiberal ideas will be excited in England, by seeing that we are endeavouring to reclaim 8 or 10 thousand indolent Beggars from Rags and Wretchedness.' Yet in the same letter he wrote, 'Here the Field of Enterprise lies in all its original weeds . . . and Here genius with £2 or £3,000 will do as much, and relatively much more, than with £30,000 in England.'¹⁹

In 1760 the Society expressed its approval of the work of the Committee for receiving contributions for clothing French Prisoners: 'So humane and so beneficent an Employment could not fail of giving the highest satisfaction to a Society whose aim it is to improve Mankind by useful arts.'²⁰ A similarly humanitarian attitude characterized the awards for industrial safety and accident prevention which it offered.²¹ 'When we reflect, as we ought, on the value of the life of a labouring man, every humane principle in us is excited to preserve him in safety',²² wrote the inventor of a method of ventilating mines. 'Your Society have had the Honour of giving Birth to many most useful Improvements, and none have rebounded more to Their Credit than the Discoveries they have adopted for easing and abridging the Labour of the Industrious, and thence their Humanity is as conspicuous as Their Patriotic Wisdom.' This was the preamble of a letter urging the Society of Arts to take steps to remedy the dreadful hardships of the climbing boys who 'are compelled to Labour in Furnaces in spite of Their anguish and Tears. In The Day time they are Crammed into Heated and Smoking Funnels. At Night in the Severest Weather They are left to rest, Poor Souls! if they can, in the Streets Under bulks on Straw, if Straw they can find.' 'We have seen', its author continued, using an argument which was to become familiar

in the agitation for factory reform, 'Noble Compassion pleading for Alleviation of The Slavery and Woes of Blacks But who pleads for those Babes born amongst us, who experience as Severe Slavery though not Sold or Bought yet as much against Their Consent?'²³ The Society's response was generous and prolonged.²⁴

'Our age . . . is the era, not of wars and conquests, but of social improvements, of emulation in the arts, sciences and manufactures',²⁵ wrote a contributor to the *Transactions* in 1845. This optimistic feeling had been shared by Francis Whishaw, Secretary of the Society from 1843 to 1845, who regarded the introduction of railways and steamships as 'the preparatory means whereby the civilization of the whole world will eventually be accomplished'.²⁶ Whishaw, whose personal association with railways was far from profitable, was to die in a workhouse, and in November, 1844, the last remaining stock of the Society was sold out.²⁷ Since 1828 the income of the Society had been declining.²⁸ Now it was left without the means to pay the premiums and bounties which were the object of its existence. A witness to this event wrote: 'The Society did not expand as the resources of the country did, but it kept on in one prescribed and beaten track, till it ultimately lost the position and good name which its founders had made for it'.²⁹

By the end of the decade it had made a complete recovery. It diagnosed the causes of its own ills as the competition of the specialized societies which had risen since 1800 and the looseness of its democratic constitution, which enabled too much time to be taken in the discussion of procedure and is said to have lost it the services of Brougham. In 1843 government by Council was established, and in 1847 a charter of incorporation was received.³⁰ The new Society no longer sought to guide the economy by fostering inventions or to encourage reforms through practical example. It became instead an essentially educational institution, hearing and publishing lectures, sponsoring exhibitions—including the Great one—and developing an extensive system of commercial examinations. Its ideals remained, nevertheless, much the same. It continued to encourage the development of the British Empire and at the same time to be interested in international exhibitions, to enjoy royal patronage and to be proud of its independence of the State.³¹ If Shipley's plan might have been acceptable a hundred years before it was written, the Society which grew out of it was none the less effective a hundred years afterwards.

D. G. C. A.

1. 'The Society for the encouragement of Arts, Manufactures and Commerce, having been . . . actuated by the most liberal motives.' *Transactions of the Society of Arts*, Vol. I (1783), p.v.

2. Sir H. T. Wood, *History of the Royal Society of Arts*, p. 46.

3. R.S.A. Loose Archives, A4/14. Secretary (Templeman), 1760.

4. 'I have no motive for offering this paper to the Society but the good of Mankind', *ibid.*, C1/45. J. Moore, 1789. 'I should be happy therefore to have it submitted to the Society whether the Offer of a Premium for the Discovery of such a Machine might not be attended with the most beneficial Consequences to Mankind', *ibid.*, C1/80. 'A contributing Member', 1789.

5. *Ibid.*, C5/79 'B.A.', 1793.

6. *Ibid.*, C2/21. Sir G. Staunton, 1790 (enclosing a letter from Thomas Paine dated 1789).

7. *Ibid.*, A16/6. J. Mease, 1801.

8. *Ibid.*, A16/19. W. Tatham, 1802. For Tatham see *Dictionary of National Biography*.

9. R.S.A. Guard Books, Vol. I, No. 126. Benjamin Franklin, 1755.

10. Dr. Templeman's *Transactions* (MS.), Vol. 2, p. 253. Copy of Henry Baker's letter on behalf of the Society to Franklin, 1756. For Franklin's association with the Society of Arts see: K. W. Luckhurst, 'The Society's early days', *Journal*, Vol. CII

(1954), pp. 297-300; E. N. da C. Andrade, 'Benjamin Franklin in London', *Journal*, Vol. CIV (1956), pp. 216-32.

11. R.S.A. Loose Archives, B3/12. G. Box (The Society to Alexander Garden), 1760. For Garden see D. Hudson and K. W. Luckhurst, *The Royal Society of Arts*, 1754-1954, p. 153.

12. 'Old vulgar prejudices against all new inventions.' *Transactions of the Society of Arts*, Vol. I (1783), p. 40.

13. R.S.A. Loose Archives, A14/28. J. Wagstaffe, 1787.

14. Ibid., A1/18. B. J. Ralph, 1756.

15. Ibid., B5/129. Anon (1795?).

16. Ibid., B2/318. J. Watson, 1812.

17. Ibid., B1/204. P. Murphy, 1810.

18. Ibid., B1/325. D. Vallance, 1841.

19. Ibid., A10/26. J. Steele, 1783. Steele's letters to the Society from Barbados are printed in *Journal of the Barbados Museum and Historical Society*, Vol. XXII, No. 2 (1955). See also *Journal R.S.A.*, Vol. CIV (1956), pp. 357-8.

20. R.S.A. Loose Archives, A4/16. 'Prisoners', 1760.

21. D. Hudson and K. W. Luckhurst, op. cit., pp. 102-9.

22. R.S.A. Loose Archives, C3/26. A. Crocker, 1791.

23. Ibid., C2/12. 'Simeon', 1790.

24. Sir H. T. Wood, op. cit., pp. 275-7; D. Hudson and K. W. Luckhurst, op. cit., pp. 106-7.

25. *Transactions of the Society of Arts*, Vol. LV (1845), pp. 89-90.

26. Francis Whishaw, *The Railways of Great Britain and Ireland practically described and illustrated* (London, 1840), p. VI.

27. Sir H. T. Wood, op. cit., p. 350; S. T. Davenport, *The Society of Arts, past and present*, p. 4.

28. Sir H. T. Wood, op. cit., p. 344.

29. S. T. Davenport, op. cit., p. 95.

30. Sir H. T. Wood, op. cit., pp. 344-51.

31. D. Hudson and K. W. Luckhurst, op. cit., Part II, *passim*.

NOTES ON BOOKS

THE ARTS AND CRAFTS OF INDIA AND PAKISTAN. By Shanti Swarup. Bombay, Taraporevala Sons & Co., 1957. Rs. 44. (London, William Dawson & Sons Ltd., £4 8s net)

The transformation of a large and under-developed colonial territory into a modern sovereign state is no easy matter. In India the problem is not merely aggravated by economic difficulties but also by the fact that the central government maintains its hegemony over peoples with differing linguistic and cultural ties, whose sympathies are often regional rather than national. Thus although Indians may at times be accused by unsympathetic observers of being too nationalistic it is a fact that nationalism as a group emotion has an important part to play by building up the unity of the nation and preserving its values against the stresses of modern civilization. To this end India's past achievements in the arts are a valuable asset; for they demonstrate the essential unity of Indian culture, propagate its ideals, and inspire confidence in national ability.

We need not then be surprised to find Mr. Swarup saying in his preface that 'Art is the vital force of a nation, the fountain from which the national life is inspired and sustained'. His intention is not to give an objective and scholarly account because he knows that for the majority of his countrymen 'Indian art has yet to be discovered'.

He therefore aims at awakening interest, does not pretend to give more than 'a short and simple exposition of the various aspects of Indian art', and is unashamedly

chauvinistic in the treatment of his subject. Seven chapters, each in the nature of a self-contained essay, deal in turn with dancing, music, painting, sculpture, architecture, minor arts and domestic ritual decoration. The pattern is more or less the same in each: a brief glance at traditional explanations of origins or early literary references, followed by a straightforward account on a chronological basis for each art form. Passages from standard works on each subject are liberally included in the various sections, especially in those devoted to painting, sculpture and architecture, and although the author has not always quoted the most up-to-date views, or has rendered facts inaccurately, it is consistent with his approach that he does not follow his guides into acknowledging too many debts to external cultures. Thus in dealing with Mauryan sculpture he rejects the suggestion that West Asiatic influences have played any part in its development, and this prepares us for his resurrection of Havell's theories of an Indian origin for the mihrab and bulbous dome in the section on Indo-Islamic architecture.

The very many illustrations, five hundred and fifteen in half-tone, two hundred and twelve line drawings and six plates in colour, must be regarded as an addition to the text rather than a part of it. At no point in the text is the reader's attention directed to particular plates, but certain of the monuments mentioned by the author have as it happens been included among the illustrations, and this will no doubt add greatly to the convenience of those who use Mr. Swarup's book as their first introduction to Indian art.

ROBERT SKELTON

BOOK DESIGN AND PRODUCTION. *Vol. I, Nos. 1 and 2. Edited by James Moran. London, Printing News Ltd., 1958. 7s 6d each*

Book Design and Production is a new quarterly from the publishers of Printing News Limited. It is something of a hybrid, part trade journal, part design magazine. I have a feeling that, at least up to the second number, *Book Design and Production* has not quite settled into its stride. It is a little difficult to find a common ground between such articles as the one by Mr. Van Krimpen 'On Related Typefaces' and the industrial profile of 'the doyenne of the book-binding supply industry'. However, Mr. Allan Delafons writes in a timely manner on 'Typographic timidity in British Book Design', yet writes with hardly a full understanding of quite what is involved in book design. He talks of 'a much needed break with tradition in book design'. Needed by whom?

Sanity still prevails in British book design. The cold logic of the New Typography calls for the precision of the German or Swiss technician; a method of design ill-suited to the British craftsman. It is a far more alien influence than the Renaissance movement in typography, so ably followed by many British publishers, following, as they do, quite dutifully, the declared aims of the Monotype Corporation, which some thirty years ago set out to imitate, as Mr. Morison says, and Mr. Van Krimpen here quotes, 'the typographical style, in its purity, of the great masters of the roman letter'. Of course, there are books, picture books particularly, where a freer method of presentation may serve well. But book designers need to be beware of falling out of the restrictions of a sound tradition into the all too binding clichés of the New Typography, which in so many respects is so similar to the Art Nouveau. Curiously enough, where our books suffer most, at least in comparison with American books, is not in design, but in workmanship, and particularly in the wretched quality of our binding, casemaking and blocking. Here is a worthy target for Mr. Delafons.

Amongst articles of interest is a design profile of Max Cafilisch of Berne, a Swiss typographer remarkable for his catholic taste and for his superb lettering. Anthony Godwin, an adventurous bookseller, surveys paper-backs. His comments on the brilliant new pictorial covers of Penguin Books are revealing. He judges them to be miscast and to be 'dressed far above their station in life'.

In the second number of *Book Design and Production*, Mr. Kenneth Day bravely refutes most of the arguments put forward by Mr. Delafons and very properly raises the question of time and cost in producing eccentric or unusual typographic arrangements. Designs that might look to be, at least on the layout pad, models of logical and functional design, often prove, when they reach the composing-room, to be costly and timewasting.

Mr. Day also writes at length on slipcases. He makes the good point that British books to-day are under-priced, compared to other commodities in this country and to books in the U.S.A. and on the Continent. To persuade the book-buying public that this is so, he thinks is largely a matter of packaging. He suggests the substitution of attractive slipcases for the ubiquitous jacket. That such packaging can be most effective has been proved by the Folio Society and by Mr. John Hadfield's *Saturday Book*. Indeed for the latter a complete box is used, carrying the same design as on the jacket within.

Other interesting articles in this number are by Miss Janis M. Yates writing on the work of the McGraw-Hill Special Educational Unit, and by Mr. Van Krimpen on the typefaces of Janson and Garamond.

In both numbers of *Book Design and Production* the latter part of the journal is devoted to 'Equipment and Supplies', and to a lengthy production review of a number of books. I wonder whether so much review space could not have been more profitably used. The journal has been beautifully printed by Benham's.

JOHN LEWIS

WOODCUTS. By John R. Biggs. London, Blandford Press, 1958. 27s 6d. net

Mr. Biggs's book on woodcuts has 206 illustrations in the space of 176 pages, which is evidence of his eagerness both to provide pictures showing how to do it, and examples of how it has been done. His book is essentially a text book designed to explain the methods of making woodcuts, wood engravings, lino cuts, and stencils, and such oddities as cardboard prints, reinforced by frequent illustrations of technique and outstanding examples of work in these media. The fact that it is a textbook, however, is disguised by the excellent decorative production of the book and the gaiety of its design.

Mr. Biggs is himself an artist and engraver, as indeed he should be to write such a book as this, and he has not only provided most of the explanatory illustrations, as well as some of the examples, but he has explained the uses of the various tools and the practice of various methods with knowledge gained by the experience of his own hand. He has followed the making of a woodcut or engraving from the selection of the wood—for which he has some unconventional suggestions—by way of the tools used, which he describes one by one, and the selection of appropriate paper, to the final printing by rubbing or on a hand press.

Mr. Biggs deals briefly with the history of his subject, which was, until comparatively recently, mostly a history of an interpretative or reproductive craft, and not that of an expressive art. The reproduction engravers of the nineteenth century, such as Swain and the Dalziells, developed techniques of extraordinary virtuosity which should be more sympathetically studied by the artist engravers of our time, but they were by no means limited to slavish reproduction, as a moment's study of their work will show. However, it was not until process engraving became triumphant that wood engraving was able to advance from the rank of craftsmanship to that of art, that it acquired a cachet to distinguish it from the mere business of graphic reproduction.

Mr. Biggs inserts a number of illustrations to enliven his brief historical chapter, but although he says who cut them and what they are, he does not give the dates at which they were made. I should like to have seen all the examples dated, in a book of this kind, so that the reader might gain some impression of the movement of style

and technique. I do not think the author is entitled to assume that his book will be read only by people who already know something of art and engraving. On the contrary, I hope it will be read by many who know little of either subject.

Certainly he has written simply enough and directly enough for anyone to understand him. I take it to be a merit that, although this book deals with a specialized subject, it is by no means only a specialist's book.

SEÁN JENNETT

ROMAN LETTERING. *London, Victoria and Albert Museum, 1958. 4s net*

It is twenty years since the last edition of the Victoria and Albert Museum booklet on Roman Lettering was issued, and that was a reprint of the 1933 edition. The present booklet has a page size ($9\frac{5}{8}'' \times 7\frac{1}{4}''$) more than twice that of the pre-war edition. This is a great improvement which enables all letters to be reproduced in a much larger size.

There is a 'double spread' of the inscription on Trajan's Column followed by larger reproductions of all the letters of the alphabet which occur on that inscription (H, K, and Y are taken from Pacioli).

The Wroxeter inscription is very clearly reproduced, as are a number of other inscriptions on stone including a lower case alphabet and figures by Eric Gill. Another improvement is the inclusion of lettering taken from medals, manuscripts, engraving and printing, concluding with Edward Johnston's sans-serif alphabet for London Transport Services. There is a page from a manuscript of Petrarch's Sonnets, an alphabet of capitals and lower case from Bickham's *Universal Penman*, 1743, and an impressive pair of pages showing two alphabets, roman and italic, from Bodoni's *Serie di majuscole e caratteri*.

The alphabet engraved by G. F. Cresci, published in 1570, here reproduced in letters $2\frac{3}{8}$ inches high, is an admirable model on which students of lettering can base style.

There is also a paragraph of notes on each example reproduced. For the price of four shillings, this is probably the best little handbook of examples of fine lettering that is available. Its usefulness would, however, be increased if the reader had been told the size of the specimens illustrated and the materials of which they are made.

JOHN R. BIGGS

FROM THE JOURNAL OF 1859

VOLUME VII. 25th February, 1859

BOOKBINDINGS INJURED BY COAL GAS COMBUSTION

Extracted from a letter written by Dr. Letheby, pursuant to a paper 'On the Library, Books and Binding, Particularly with regard to their Restoration and Preservation', read by John Leighton, F.S.A.

Through the kindness of the managers of the Athenæum Club House, I have had access to the various documents which they possess on the subject of the injury done to the library of that Institution by the products of burnt gas; and I find that in the summer of 1842 a committee was appointed to investigate this subject, and that the services of Professors Faraday and Brande, Mr. Aikin, Mr. Brown, and Dr. Prout, were enlisted. Without going into the detail of their investigation, which went to show that oil of vitriol was the great cause of the mischief, I will inform you of the result at which they arrived. Dr. Prout said that he had taken two equal portions of the water used in the house, and had exposed one of these for a fortnight to the air of the drawing-room of the establishment; by which means he found that it thereby acquired a striking increase of sulphuric acid, so that when it was evaporated nearly to dryness it distinctly reddened litmus paper, and showed the presence of free sulphuric acid. 'This', said Dr. Prout, 'sufficiently explains the destruction of the books, nor will there be any improvement till the gas is either removed or its fumes conducted away

by appropriate chimneys'. Mr. Faraday and Mr. Aikin agreed in this opinion; and the committee resolved that, as from the above experiment it appeared that much of the injury suffered by the books in the library is owing to acid vapours evolved by the combustion of the gas, it is advisable that, for the preservation of the library, the gas should either be discontinued, or that some arrangement be adopted for carrying off the fumes by an improved system of ventilation. In the end the latter was adopted at the suggestion of Professor Faraday and, although the mischief has been to a great extent abated, yet, I am informed by Sir Henry Ellis, that he thinks he sees a certain degree of injury still progressing. Through the kindness of Mr. Magrath, the Secretary of the Club, and Mr. Spencer Hall, the Librarian, I am enabled to show . . . numerous specimens of the covers of books which have been thus injured . . . wherever they have been exposed to the atmosphere containing the vapours of burnt gas, they are as rotten as tinder; indeed, it often happens that the covers give way in attempting to remove the book from its place on the shelf.

At the London Institution, in Moorfields, the books have suffered in a similar way; and Mr. Brayley, the Librarian, tells me that the books situated in the upper part of the room suffer most. He noticed that the surface of the leather of the binding lost its smoothness, and eventually the whole was reduced to a brittle substance, composed of scarcely coherent powder, which had a powerful acid taste; to this, he adds that evidence has been obtained from bookbinders, as well as booksellers, of the deleterious action of gas lights and gas stoves on the bindings of books. In consequence of this a ventilating apparatus has been put up in the library of the Institution.

Mr. Spencer Hall informs me that almost the entire library of the Earl of Tyrconnel, at Kilpin, in Yorkshire, whose mansion is lighted with gas, has been destroyed in a similar way. . . .

Some Activities of Other Societies and Organizations

MEETINGS

- SAT. 24 JAN. Horniman Museum, London Road, Forest Hill, S.E.23. 3.30 p.m. Clifford Musgrave: *The Regency house.*
- MON. 26 JAN. Radar and Electronics Association. At Royal Society of Arts, John Adam Street, W.C.2. 7 p.m. D. W. Fry: *The pinch approach to thermo-nuclear reactions.*
- WED. 28 JAN. Radio Engineers, British Institution of, at London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1. 6.30 p.m. Professor D. B. Fry: *Speech recognition and the phonetic typewriter.*
- THURS. 29 JAN. Carriage and Automobile Manufacturers, Institute of British, at Royal Society of Arts, John Adam Street, W.C.2. 7 p.m. D. N. Walker: *Body hardware.*
- Engineering Designers, Institution of, at Midland Hotel, Bradford. 7.30 p.m. R. H. Harrison: *Management and productivity.*
- Radio Engineers, British Institution of, at Winter Gardens, Malvern. 7 p.m. B. V. Somes-Charlton: *Industrial and underwater television.*
- TUES. 3 FEB. Chemical Engineers, Institution of, at Manchester College of Science and Technology, Jackson Street, Manchester. 3 p.m. Discussion: *Effluent disposal and air pollution.*
- Civil Engineers, Institution of, Great George Street, Westminster, S.W.1. 5.30 p.m. F. S. P. Turner: *Preliminary planning for the new Tube railway across London.*
- Metals, Institute of, at Cadena Café, Cornmarket Street, Oxford. 7 p.m. Professor A. D. McQuillan: *New metals: the rare earths.*
- WED. 4 FEB. Victoria & Albert Museum, Exhibition Road, S.W.7. 6.15 p.m. Dr. Ada Polak: *Medieval art in Norway.*
- THURS. 5 FEB. Refrigeration, Institute of, at 76 Mark Lane, E.C.2. 5.30 p.m. H. J. Goldsmid: *Thermo-electric cooling.*
- SAT. 7 FEB. Horniman Museum, London Road, Forest Hill, S.E.23. 3.30 p.m. R. A. Skelton: *Captain James Cook's voyages in the South Seas and their scientific value.*
- Interplanetary Society, British, at Caxton Hall, Westminster, S.W.1. 8 p.m. Dr. F. Fitzgerald: *High energy fuels and rocket propulsion.*

- TUES. 10 FEB. Chemical Industry, Society of, 14 Belgrave Square, S.W.1. 6 p.m. W. D. Jamrack, R. A. Wells, and Dr. J. H. Buddery: *The extraction of Thorium.*
- Works Managers, Institution of, at Royal Society of Arts, John Adam Street, W.C.2. 7 p.m. R. S. Geoghegan: *Classification as a means to control variety.*
- THURS. 12 FEB. Chemical Society, at the Imperial College of Science and Technology, South Kensington, S.W.7. 7.30 p.m. E. R. H. Jones: *Polysilylenes.*
- FRI. 13 FEB. Engineers, Junior Institution of, 14 Rochester Row, Westminster, S.W.1. 7 p.m. Dr. J. G. King: *Energy demands in Britain and a fuel policy.*
- MON. 16 FEB. Royal Geographical Society, 1 Kensington Gore, S.W.7. 8.30 p.m. Group-Captain H. St. C. Smallwood: *Mongolia, 1956* (illustrated with a film).
- TUES. 17 FEB. Architects, Royal Institute of British, 66 Portland Place, W.1. 6 p.m. N. Keith Scott: *A architect looks at America.*
- WED. 18 FEB. Victoria & Albert Museum, Exhibition Road, S.W.7. 6.15 p.m. Peter Thornton: *The design of eighteenth-century silks.*
- THURS. 19 FEB. Road Transport Engineers, Institute of, at Royal Society of Arts, John Adam Street, W.C.2. 6.30 p.m. Dr. H. J. Starks: *Research on the testing and performance of commercial vehicle brakes.*
- William Morris Society, at Kelmscott House, Upper Mall, Hammersmith, W.6. 7 p.m. Edward Barsley: *William Morris and the workshop of to-day.*
- FRI. 20 FEB. Engineers, Junior Institution of, 14 Rochester Row, Westminster, S.W.1. 7 p.m. E. Fincham: *The selection and use of arc welding processes.*
- MON. 23 FEB. Royal Geographical Society, 1 Kensington Gore, S.W.7. 5 p.m. J. G. D. Pratt and Dr. Hal Lister: *Glaciological research on the Trans-Antarctic expedition.*

OTHER ACTIVITIES

- NOW UNTIL 28 FEB. Cultural Relations with the U.S.S.R., Society for, 14 Kensington Square, W.8. Mon to Fri. 11-6 p.m. Book display of famous Russian and Soviet painters.
- NOW UNTIL SUN. 1 FEB. Commonwealth Institute, South Kensington, S.W.7. Mon. to Fri. 10-4.30 p.m. Sat. 10-5 p.m. Sun. 2.30-6 p.m. Patsy Foard: *Exhibition of work done during recent visits to Italy and Iceland.*

